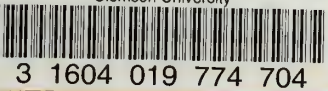


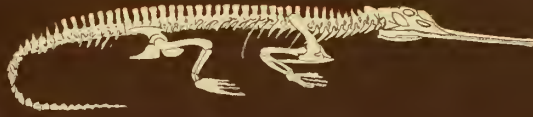
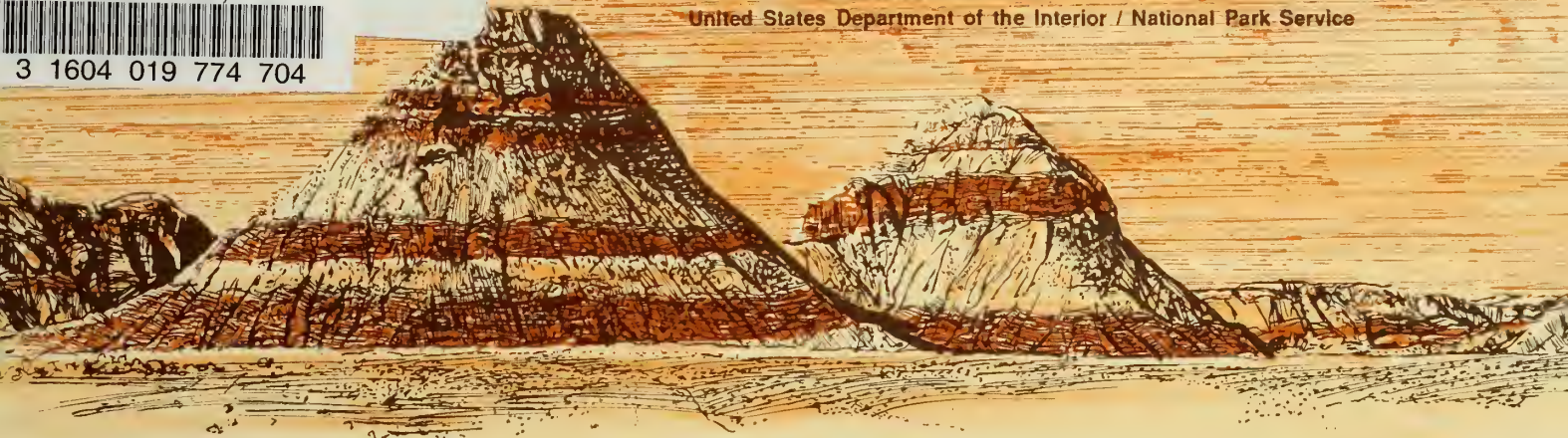
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PETRIFIED FOREST NATIONAL PARK

United States Department of the Interior / National Park Service

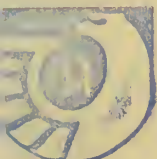



DRAFT GENERAL MANAGEMENT PLAN/DEVELOPMENT CONCEPT PLANS/ENVIRONMENTAL IMPACT STATEMENT

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Draft
General Management Plan
Development Concept Plans
Environmental Impact Statement

Petrified Forest National Park
Navajo and Apache Counties, Arizona

This *Draft Environmental Impact Statement* presents a proposal and three alternatives for the management, use, and development of Petrified Forest National Park. The proposal, which constitutes the National Park Service's draft general management plan for the park, calls for a reorientation of management and use to more adequately preserve and interpret the park's globally significant paleontological resources and to manage them as integral parts of an evolving environment that also contains significant cultural, natural, and scenic values. Major features of the plan include a new visitor center at Tiponi Point, a research center at Tiponi Point, increased emphasis on trails and guided tours into the park's resource sites, rehabilitation and public use of the historic Painted Desert Inn, replacement and expansion of inadequate administrative and maintenance facilities, relocation of some park housing to remove it from the Giant Logs visitor use area, and expansion of the park boundary to preserve significant paleontological and archeological resources that currently extend outside the park. The environmental consequences of this proposal would include increased protection and understanding of highly significant paleontological and archeological resources inside the park and of closely related resources currently outside the boundary. Directly, through their park experiences, or indirectly, through the knowledge learned from research, people would gain a better understanding of the history of life, which might promote a desire to live in better harmony with nature, an unquantifiable but very real contribution to the quality of life. About 22 acres of undisturbed habitat, mostly desert scrub near Tiponi Point, would be disturbed by development. No critical habitat for listed species would be negatively affected. Approximately 97,800 acres would be added to the park. Slightly more than half of these lands are currently in private ownership, and 45 percent are in state or federal ownership. The traditional use of these lands, livestock grazing, would be phased out, resulting in the loss of this source of income to the current owners. The expansive vistas visible from the park would be protected from encroachment by structures and possibly a waste dump. Many additional square miles of shortgrass prairie would recover from the effects of overgrazing.

The alternatives under consideration, in addition to the proposal, include the no-action alternative and two development options. One development option (minimum requirements) would replace and expand deteriorated and undersized facilities on their current sites. Under this option the north visitor center would remain at the headquarters area, rather than being relocated to Tiponi Point, and the residential area at Giant Logs would be expanded to meet staff housing needs. The other development option would remove most of the existing development from the Giant Logs area and replace it with a visitor center designed specifically to house the proposed interpretive program. In most other respects these alternatives would be the same as the proposal.

The review period for this document ends January 2, 1992. All comments must be received by that time and should be addressed to

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Summary

Petrified Forest National Park contains a variety of significant natural and cultural resources, including some of the most valuable paleontological resources in the world. The Chinle formation at Petrified Forest, which creates the spectacularly beautiful landscapes of the Painted Desert, Blue Mesa, and other park features, is probably the best place in the world for studying the Triassic period of Earth's history. The Triassic is considered by some scientists to be the time when all the modern ecosystems were established, and the Triassic beds at Petrified Forest promise to contain a comprehensive record of this time of transition. The park also contains more than 500 archeological and historic sites chronicling a prehistoric interchange of cultures in a frontier trading zone and the historic use of the Puerco River valley as a transportation corridor. The park's shortgrass prairie ecosystem is perhaps the best example of its kind in northeast Arizona.

The proposal and alternatives address the needs to (1) help visitors appreciate the significance of the park's resources, (2) protect resources from theft and other threats, (3) protect resources and park values extending beyond the park's current boundaries, (4) initiate and coordinate research, and (5) provide adequate support facilities.

Alternative 1 (the no-action alternative) would continue existing programs to protect and interpret the park's resources. Natural and cultural resources would be protected under existing authorities. However, theft of petrified wood is an ongoing problem, and with a continuation of current use patterns and patrol capability, all the easily accessible sources might eventually be depleted. Most paleontological research in the park would be conducted by private institutions, who would tailor the studies to their own specific objectives and preserve the park's fossil record in scattered collections. Archeological resources would be methodically researched and preserved by the existing regional archeological center. More than half of the Chinle formation exposed in this area and some significant archeological resources would

remain unprotected outside the park boundary, where mining, theft, and vandalism would continue to diminish their integrity.

No new land disturbance would occur under this alternative, since there would be no new development. Visitors would continue to receive limited orientation and interpretation at inadequate and outdated facilities. Many visitors would continue to leave the park before seeing any resource areas. Most visitors would experience the park through a series of brief stops at scenic overlooks without understanding the significance of what they were seeing. Park management would continue to be hampered by inadequate support facilities, including housing.

Alternative 2 (the proposal) would increase efforts to identify and protect paleontological and archeological resources. A research center would be established to support field work by NPS and cooperating scientists. The Park Service would increase efforts to educate visitors about the importance of paleontological and archeological resources and to patrol significant resource sites to reduce theft of petrified wood. Long Logs, which still retains a natural litter of petrified wood, would be closed to vehicle access to help protect it. The NPS housing and maintenance facilities in the Giant Logs area would be relocated to a mesa top to the north to eliminate this intrusion on a significant resource area.

In addition, the National Park Service would propose that Congress expand the park boundary to include the remainder of the globally significant Chinle outcrop that cuts across the park, along with several highly significant archeological resources. Boundary changes to protect these resources would also protect the expansive vistas seen from the park. Approximately 97,800 acres would be added to the park. Slightly more than half of these lands are currently in private ownership, and 45 percent are in state or federal ownership. Lands adjacent to the park have been managed for livestock grazing for the past 120 years. However, mineral exploration and subdivision

activities are beginning to occur, and a large waste dump has been proposed. If these lands were included in the park, private uses would be phased out, resulting in the loss of current and potential sources of income for the current owners. Nine private landowners have holdings ranging from 1,600 to 9,280 acres.

Under alternative 2, the three geographic areas of the park – the Painted Desert, Puerco River valley, and Rainbow Forest – would each be used differently to provide visitors with a varied experience as they traveled through the park. The Painted Desert would provide a backdrop for giving visitors the big picture of Earth processes and how the landscape visible today is also the manifestation of events that occurred 230 million years ago. A new visitor center would be developed near the rim of a side canyon of the Painted Desert for this purpose. The research center would be nearby, and research activities would be interpreted as part of the visitor program. Interpretation in the Painted Desert Inn and at a new contact station in the Puerco River valley would focus on history and archeology. In the Rainbow Forest area visitors would be encouraged to experience fossils close up through a variety of guided and self-guiding tours into the backcountry. A smaller visitor center in this end of the park would provide information to people entering from the south and introduce them to the great variety of Triassic fossils in the park. People would then be encouraged to spend time in the backcountry discovering the richness of the park's paleontological, archeological, and scenic resources. The 1930s structures at Giant Logs would be adaptively used for the visitor center, ranger station, and concession facilities.

The park's administrative facilities and housing, most of which are structurally unsound, would be replaced and expanded to meet standard square footage and design requirements. Most of these facilities would be replaced at their existing sites, but most of the housing and the maintenance buildings in the Rainbow Forest area would be eliminated and replaced with a new park housing and maintenance complex on the mesa top northwest of Giant Logs. One residence would be retained at Giant Logs for emergency response capability.

New development under alternative 2 would have potential to disturb paleontological, cultural, and natural resources. All development sites would be surveyed for fossils, cultural resources, and threatened or endangered species prior to any ground disturbance, and potential impacts on these resources would be avoided or mitigated. New ground disturbance would remove about 16 acres of desert scrub at Tiponi Point, ½ acre of shortgrass prairie at Blue Mesa, and 6 acres of shortgrass prairie on the mesa top northwest of Giant Logs. Adaptive use of the 1930s buildings at Giant Logs for a visitor center, ranger station, and concession facilities would allow the removal of aesthetically intrusive modifications made over the years to improve the buildings' liveability.

Alternative 3, a minimum-requirements development option, would avoid the adverse effects of ground disturbance at Tiponi Point by replacing and expanding the visitor center at its existing location near the headquarters. It would minimize new development in the south end of the park by rehabilitating the 1930s houses at Giant Logs and constructing some additional housing near the existing structures. This would avoid ground disturbance on the mesa top northwest of Giant Logs but increase the intrusion of development into the Giant Logs resource area. In most other respects this alternative would be the same as alternative 2.

Alternative 4, another development option, would demolish most of the 1930s structures at Giant Logs and replace them with a visitor center designed specifically for the proposed interpretive program. The existing visitor center/ranger station would be devoted exclusively to ranger activities. Most employee housing and maintenance would be relocated to the mesa top northwest of Giant Logs, as in alternative 2. This alternative would reduce the development visible from Giant Logs and Long Logs and restore the areas to more natural conditions. However, it would demolish several 1930s houses, which although currently lacking historic integrity, might otherwise be rehabilitated to make them eligible for the National Register of Historic Places. In most other aspects this alternative would be the same as alternative 2.

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Part One: Purpose and Need for the Plan / Overview of the Park





Purpose and Need for the Plan

The latest master plan for Petrified Forest National Park was completed in 1966. Since that time the park has experienced an unprecedented period of scientific discovery. Paleontological research is piecing together an understanding of an ecosystem dating from 230 million years ago, during the Triassic period of the Mesozoic era of Earth's history. No longer are the park's abundant petrified logs seen merely as a beautiful collection of oddities. They are now known to be part of an ancient ecosystem that represents an especially significant time in the evolution of life – a time of transition, when earlier life forms were giving way to the earliest dinosaurs. The Petrified Forest member of the Chinle formation is considered the best place in the world for studying this part of the Triassic period, making it a globally significant paleontological resource. The park is also important for archeological research, which is uncovering another story of 10,000 years of human habitation in a scientifically important transition area between major cultural centers.

When President Theodore Roosevelt created Petrified Forest National Monument in 1906, the stated purpose was to reserve "the mineralized remains of Mesozoic forests...[which] are of the greatest scientific interest and value." Subsequent proclamations and acts of Congress expanded the park to include "additional features of scenic and scientific interest," including cultural, as well as natural, resources. The drafters of the presidential proclamations and congressional legislation had no way of knowing the variety or the significance of the natural and cultural resources they were protecting. However, the mandate they provided was sufficiently broad to accommodate an expanding awareness of the many facets of the ancient forest ecosystems and the human history now coming to light in the park and the promise they hold for gaining more knowledge of life on Earth.

A new general management plan is needed to guide visitor use, resource management, research, and park operations in light of the broadening perspective on the significance of the

park's resources. Some major planning issues are raised by this changing perspective. One is how best to refocus the visitor experience to make people aware that the park encompasses more than just petrified logs and to help them understand how all the park's natural and cultural resources interrelate. The park staff has been working hard to keep visitors abreast of the paleontological and archeological discoveries occurring at the park, but their efforts are currently severely hampered by the park's out-of-date visitor centers and by other facility and staffing problems.

A closely related issue is how to control theft of petrified wood. An estimated 12 tons of petrified wood are stolen from the park each year, mostly by visitors. The park staff has experimented over the years with a wide range of methods of deterring theft; still, many visitors apparently do not understand and appreciate the significance of the wood and the importance of preserving it on site. As other fossilized remains and cultural artifacts are brought to visitors' attention, they too will be increasingly susceptible to theft.

A broader issue is how to protect resources that extend beyond the park's current boundaries. The Chinle formation continues east of the park boundary in a relatively narrow strip that ends in the vicinity of Ninemile Seep, approximately 11 miles east of the park. The traditional land use in this area, grazing, has been compatible with the protection of paleontological values because livestock have generally avoided the poor habitat created by the Chinle outcrops. However, a landfill has now been proposed that would initially cover a square mile including portions of the Chinle formation and potentially grow to a 20-square-mile megadump adjoining the park's east boundary. The National Park Service deplors the potential destruction of globally significant paleontological resources that could greatly expand our knowledge of Earth's changing atmosphere, seas, continents, and life forms. The Park Service is also concerned about the long-term preservation of archeological resources and scenic vistas that are important to park values

but were excluded from the park's section-line boundaries. Existing threats to significant resources, in addition to the landfill proposal identified above, include subdivisions, petrified wood mining and theft, pot hunting, and mineral exploration. No control currently exists for avoiding or mitigating the derogation of resources and viewsheds important to the park.

Another major planning issue is how to initiate and coordinate paleontological research efforts. Most of the research in the park is currently being conducted by academic institutions, and to date park managers have not been able to assume the responsibility of caring for the park's paleontological resources or to generate the information most needed for resource protection and interpretation.

The final major issue addressed by the general management plan is the need for adequate support facilities and whether these facilities, most notably housing, should be retained in their existing locations or relocated to other sites inside or outside the park. A lack of adequate seasonal housing makes it difficult for the park to compete for seasonal employees, indicating that some new construction is needed. All of the housing in the park headquarters area is badly in need of repair, and it may be more desirable to replace this housing than to rehabilitate it. The housing in the south end of the park, which also is in need of rehabilitation, is situated in a prime resource area adjacent to the visitor center, raising the question of its possible relocation.

Overview of the Park

The colorful badlands of Petrified Forest—yellow mudstone, gray and green siltstones, purple and blue claystones, pink tuff, red and tan sandstones—are the present-day manifestations of the Chinle formation, which accumulated layer upon layer over a period of several million years...but not the several million years that have just passed. The Painted Desert, Blue Mesa, and other prominent features visible in the park today are the results of events that occurred 230 million years ago, during the Triassic period of Earth's history. To understand the Triassic period and its current manifestations requires some radical adjustments in our everyday perceptions of time and place.

Most geologic time lines start about 3.8 billion years ago, when the earliest life is believed to have appeared. For more than 3 billion years only primitive animals and plants inhabited the seas. Then about 0.4 billion (or 400 million) years ago, higher (vertebrate) animals appeared, followed by vascular plants, and the scene began to look more familiar. By the beginning of the Triassic period, about 250 million years ago, Earth was inhabited by a variety of fishes, amphibians, and reptiles. Plants included giant ferns, towering evergreens, and palmlike cycads, but flowering plants and grasses had not developed yet. Neither had birds or mammals—or even dinosaurs. Life on Earth was on the brink of a transition that would finally establish all the major groups of animals and plants we know today.

That long ago, Earth itself was a different place. Throughout all of geologic time the Earth's crust has been constantly moving, molding and remolding the continents and the seas. About 230 million years ago the area now called Arizona lay along the western shore of Earth's single supercontinent, Pangaea. It was nearer the equator than it is today, and the land mass was tilted and configured in such a way that present-day New Jersey was at about the same latitude as Arizona. Also, present-day North America and Eurasia were joined, and central Europe was relatively close to New Jersey.

Because of their geographic similarities, these areas had many of the same plants and animals, as evidenced by their fossil records.

Petrified Forest National Park contains unusually rich Triassic fossil beds because of a series of geologic events unique to that area. During the Triassic, the western coastal area around Arizona was unstable, and volcanic mountains were forming in the Mogollon Highlands. Tremendous amounts of volcanic material were being carried north by many streams and deposited in the area of what is now the park. This rapid deposition was conducive to the burial, preservation, and fossilization of the plants and animals inhabiting the area.

By 100 million years ago the area that would become the park was deeply buried under thick layers of sediment. Then about 35 million years ago the strata were thrust upward, greatly increasing their exposure to wind and rain, and the layers of sediment began to be gradually



The continent of Pangaea in the late Triassic, showing fossil sites including (1) Petrified Forest National Park, (4) Newark, New Jersey, and (5) Keuper, Germany. Courtesy Museum of Northern Arizona.

stripped away. Today the lack of overburden makes the Triassic deposits in the park some of the most accessible for study, greatly increasing their scientific value. Furthermore, the fossils preserved at the park appear to represent entire ecosystems. These rare accessible associations of both animals and plants make it possible to learn more about the Triassic period here than anywhere else in the world. To date, about 148 species of plants and about 50 species of animals have been identified in the multicolored strata known to scientists as the Petrified Forest member of the Chinle formation.

The Triassic Forest

What is not known about the Triassic greatly exceeds what is known. From the available evidence scientists suspect that the area that is now the park was a swampy woodland. The petrified logs seen in the park today are the remains of *Araucarioxylon*, *Woodworthia*, and *Schilderia* trees, all of which were tall conifers. Relatively few stumps have been found, leading to speculation that many of the logs may have washed in from higher, more densely wooded areas to the south, perhaps in the aftermath of volcanic eruptions.

Numerous streams cut across these woodlands on their way to the sea. Heavily scaled fishes, some up to 6 feet long, inhabited the waters, along with a number of amphibians and reptiles. Notable among the amphibians were the metoposaurs, 10-foot-long creatures looking something like giant salamanders with teeth. The reptiles included phytosaurs (which looked like crocodiles), aetosaurs (horned and heavily armored dinosaur-like animals), and poposaurs (large carnivores that walked on two legs). These animals looked much like dinosaurs, but they were actually thecodonts, an earlier group of reptiles that dominated Earth for millions of years, just as the dinosaurs would do in the next period of Earth's history.

By the late Triassic, the first dinosaurs were just beginning to appear, and some of the earliest dinosaur fossils known in the world have been found at Petrified Forest National Park. What

scientists will ultimately learn from research at the park remains to be seen, but there is great excitement that the dawn of the dinosaurs is documented better here than anywhere else in the world. Furthermore, the Triassic is now considered by some paleozoologists and paleobotanists to be the time in Earth's history when all the modern ecosystems we know today were being established. The earliest mammals appeared then, and there is speculation that birds and flowering plants also began in the Triassic. The Triassic clays and shales at Petrified Forest, with their rich associations of plant and animal fossils, promise to contain a comprehensive record of this time of transition, helping us understand more of our legacy from the past.

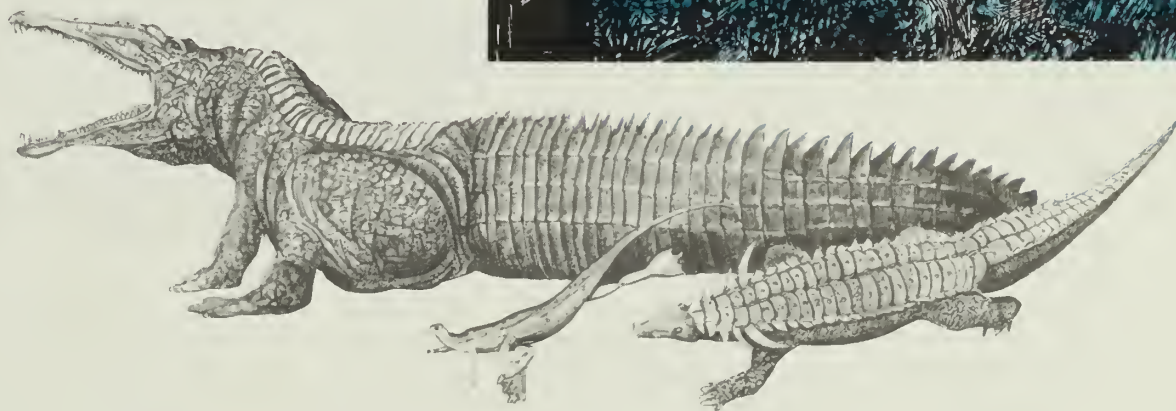
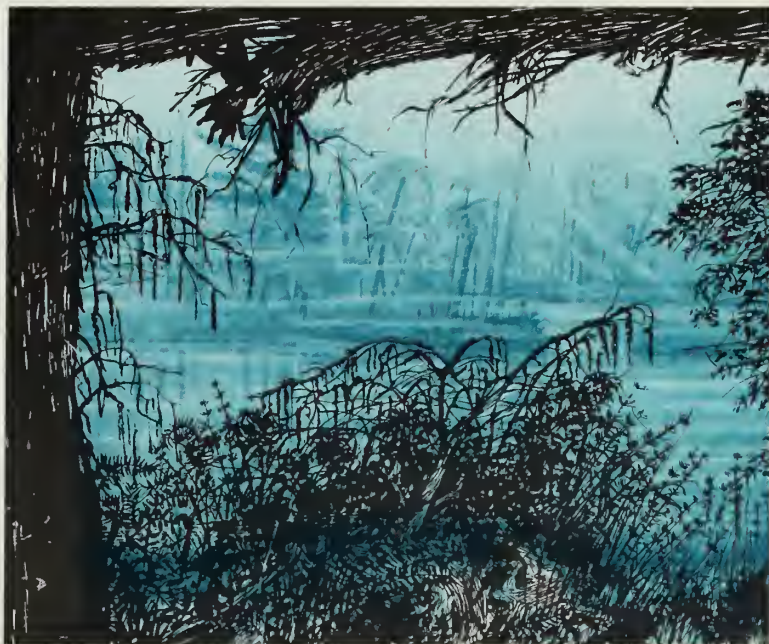
The Modern Desert

Today what was once a low and swampy region is high desert. It is hard to believe that in the entire 147-square-mile park only ten named drainages exist and that none of them has a perennial stream. Rain puddles on rocks soon evaporate. What little surface water occurs is during spring runoff or right after heavy rains. The few springs are also seasonal. Although the duration of surface flow is short, the impact of flowing water on the landscape is great, judging from the many striking erosional features. The resulting stark and colorful landscape is ever-changing with the interplay of light and shadow and the vagaries of the weather. This is a land of immense vistas. The impression on visitors can be sublime and invigorating, or in environmental extremes, daunting.

The park's high elevation (averaging 5,600 feet above sea level) plus its present-day position inland on the continent combine to create a cool, arid climate. Precipitation averages less than 10 inches a year, about half of which is from thunderstorms in late summer. On midsummer days temperatures occasionally exceed 100 degrees Fahrenheit, but nights are cool. And although winter nights are often colder than freezing, the daytime temperatures are moderate. Because of the cool, dry climate, air quality is excellent, and mountain peaks more than 100



TRIASSIC FOREST



miles away are often visible from the park. The wide scenic vistas and clean air seem almost as exotic to some visitors as petrified wood and fossilized bones.

The park is best described in terms of three distinctive geographic areas: the Painted Desert, the Puerco River Valley, and the Rainbow Forest.

Painted Desert

The northern third of the park is an expanse of roughly southwest-to-northeast-trending clay hills, mesas, and buttes that reflect the regional geologic influences of the Little Colorado River as it erodes the Chinle formation in this portion of the Colorado Plateau. The dramatic background of mesa cliffs and escarpment rimrock against the far horizon is a result of resistant sandstone and lava caprock overlying more easily eroded layers of clay and shale. The highest elevation in the park occurs in the Painted Desert on the summit of Pilot Rock at 6,236 feet above sea level. Pilot Rock is on the northwesternmost extension of three parallel eroded ridges. Views of the middle and largest of these ridges are what most visitors take home as memories of Painted Desert. The southeasternmost ridge is actually the Painted Desert rim, upon which the park road and viewpoints are built. The large drainage at the base of the clay hills is *Lithodendron* (Greek for *stone-tree*) Wash, named for the petrified wood found within the drainage. The floor of the Painted Desert is also the site of the recent excavation of early dinosaur bones.

In areas of very active erosion, like the Painted Desert, little vegetation grows because it is difficult for plants to take root in the sterile, expanding clays. Only a few grasses and tenacious shrubs manage to survive in isolated pockets scattered throughout the eroding hills and sandy desert washes. Some pinyon-juniper woodland occurs along the Painted Desert rim and on mesa tops, particularly on Chinde Mesa and Pilot Rock. One of the shrubs associated with this woodland is golden buckwheat, which produces one of the park's seasonal spectacles

when it blooms on the slope behind Chinde Point.

Puerco River Valley

From the Painted Desert rim the land slopes gently to the southeast, down through a series of wide erosional basins to the Puerco River. The middle section of the park is a relatively narrow strip of land across this valley that connects the badlands to the north and south. The lowest point in the park, approximately 5,300 feet above sea level, is along the river. Various mixed shrubs and grasses cover this high desert river valley. This shortgrass prairie may be the best example of its kind in northeastern Arizona. The park's wildlife is naturally concentrated in this valley, where the vegetation provides needed forage and cover. Several large mammals, including pronghorn and coyotes, are often seen from the road. The descendants of the ancient reptiles are also in evidence to those who have time to see. Painted Desert whiptail lizards scurry away in front of hikers, while Hopi rattlesnakes lie still under the bushes or beside petrified logs, waiting for hikers to move on.

Rainbow Forest

In the southern third of the park the land has eroded into small groups of buttes and mesas separated by the wide expanses of the drainage basins of Dry Wash and its tributaries. The shortgrass prairie and desert shrubland become widely interspersed with badlands as barren as those on the floor of the Painted Desert. Large deposits of multicolored petrified wood are scattered throughout the area. Blue Mesa, Jasper Forest, Crystal Forest, Long Logs, and Giant Logs are petrified wood areas easily accessible from the park road. High points on Blue Mesa and the Flattops offer wide panoramas over the clay hills of the fossil-rich Chinle formation. Numerous thecodont skeletons have been excavated here, and bone fragments, teeth, mollusk shells, and other fossilized animal remains, and also ancient plant materials, are readily apparent to knowledgeable observers.



GEOGRAPHIC AREAS

Human History

Compared to the geologic history of northern Arizona, the human history represents only a moment of time. Scattered bits of chipped stone and colorful pottery, the ruins of pit houses and pueblos, traces of trails and roads, historic buildings, and other archeological and historic features tell us that people have occupied the area that is now the park for about the past 10,000 years.

A few hearths and chipped stone artifacts on mesa tops and ridges attest to the lifestyles of people who moved frequently as they hunted a variety of game animals and gathered wild plants in the Petrified Forest area during the Archaic period. Later, more permanent sites, including shallow slab-lined pit houses, mark the beginnings of agriculture during the Basketmaker period extending from A.D. 300 to 800. Small pueblos clustered on terraces near arable land and major watercourses mark the beginning of the Pueblo period, thought by some archeologists to have been marked by a regional drought that extended from about A.D. 750 to 1000. Excellent examples of rock art, including solar calendars, reflect the cultural richness of the Pueblo II period (A.D. 950-1100), a time of great regional change during which populations increased and trade flourished. The area of the park was a frontier trade zone between the Anasazi to the north and east, the Mogollon from the mountain country to the south, and the Sinagua to the west. The Newspaper Rock Petroglyphs Archeological District is probably one of the best concentrations of rock art in the Little Colorado River drainage.

The Puerco ruins, one of the most visible archeological resources in the park, date from near the end of the Pueblo period, when large planned communities with multistory dwellings and large kivas were built. Another period of drought, perhaps exacerbated by warfare and other factors, probably contributed to the abandonment of much of the Southwest during the mid 1400s. According to some native American legends, the Pueblo peoples went north at this time to settle on the high mesas, where permanent water was available.

Sometime during the next two centuries Navajo and other Athapascan peoples moved into the Southwest. Only scattered sites mark the presence of these groups in the park. The earliest remains from historic times are the traces of trails used by explorers, wagon trains, and even an experimental military camel train. Because of the low gradient, the Puerco River valley became a major historic travel corridor, and it remains so today. The old 35th Parallel route, old Route 66, Interstate 40, and the Santa Fe Railroad all cross the park here, following the lay of the land.

The Petrified Forest was first brought to the attention of the American public in the mid 1800s through the reports of U.S. Army expeditions. Logs were collected and shipped to the Smithsonian Institution, and geological surveys were conducted. The growing excitement over the area's scenic and scientific values spurred the Land Office to withdraw the area from homestead entry. However, the petrified forests remained vulnerable to wood theft, which reached alarming proportions with the completion of the railroad in the early 1880s.

When President Theodore Roosevelt signed the Act for the Preservation of American Antiquities in 1906, it marked the culmination of several decades of struggle by John Muir and others to conserve America's southwestern scenic, historic, and scientific sites. Within three months of the passage of the act, Petrified Forest National Monument was created to preserve and protect the concentrations of fossilized wood. However, it was almost two decades more before the monument had a full-time resident superintendent, and the large-scale theft of wood continued well into the 1920s. In fact, the earliest caretakers of the monument were allowed to sell petrified wood to supplement their "salaries" of one dollar per year.

With the completion of the railroad, northern Arizona's astounding landscapes began drawing increasing numbers of tourists. Adamana, a railroad town about 2 miles west of the Puerco Indian ruins, was the first local center of tourist facilities. By the late 1920s, a trading post had been established near Giant Logs at what was

then the NPS headquarters for the national monument. An inn had also been built on the Painted Desert rim at Kachina Point, which was then some distance north of the monument. In the early 1930s the National Park Service acquired the Painted Desert and a thin strip of land to connect the monument's two units.

The Depression years marked a number of changes at the monument. An attractive museum and headquarters complex near Giant Logs, a new bridge across the Puerco River, and a new road to join the north and south units were constructed by Arizona contractors. The Civilian Conservation Corps and Works Progress Administration rebuilt the Painted Desert Inn and worked on a variety of smaller tasks, including trails, roads, fences, antelope reservoirs, and water and sewer systems. Most of this development is still in use today, augmented by

a new headquarters/visitor center complex built in the 1960s to serve travelers entering the north end of the park from I-40.

Petrified Forest gained national park status in 1962, and portions of the park were designated as wilderness in 1970. During the course of the park's history its boundaries have changed several times, most recently in 1986. Today the park encompasses 93,533 acres in Navajo and Apache counties.

Now, in the early 1990s, the systematic paleontological and archeological research that has been conducted in the park since the 1920s is culminating in major discoveries, ushering in a new era of park history that will see major changes in visitor use and resource management.

SUMMARY OF THE SIGNIFICANT RESOURCE VALUES

PETRIFIED FOREST NATIONAL PARK



Globally significant scientific value of paleontological resources in such quantity and variety as to illustrate the ecological relationships that existed during the Triassic period of Earth's history

Scenic value of expansive vistas of colorful eroding badlands, stark landscapes, and the rainbow hues of petrified wood





Scientific value of a rare shortgrass prairie ecosystem recovered from grazing

Cultural value of an extensive and varied prehistory that reflects a 10,000-year continuum of human adaptation, cultural interaction, and technological change



Part Two: The Proposal (Draft General Management Plan)



Introduction

The proposal described in this section constitutes the National Park Service's draft general management plan for Petrified Forest National Park. It is a comprehensive proposal for all aspects of future management and use of the park, including visitor use, management of natural and cultural resources, operations, development, and proposed boundary changes.

As part of the planning process, the National Park Service considered four alternatives: this proposal, a no-action alternative, and two development options. The other alternatives are described and compared to the proposal in part four of this document.

Management Goals and Zoning

Management Goals

The National Park Service proposes three primary management goals for the park:

The globally significant paleontological resources of the Chinle formation, the continuum of prehistoric sites, the recovered shortgrass prairie ecosystem, and the expansive vistas of colorful eroding badlands should be protected, retaining their value for future generations.

Visitors should be given a wide range of sensory and perceptual opportunities to experience the park's land and its paleontological, cultural, ecological, and scenic resources, and to understand them in the broad context of Earth's history.

Scientific inquiry into the Triassic period of Earth's history should be encouraged and supported.

There is a potential for conflict among these goals, in that visitor use and research inevitably result in some disturbance of the land and its resources and also may interfere with one another. But there is also potential for harmony. For example, excavation, documentation, and placement in a museum is often the only way to preserve fossils that are eroding out of their protective overburden. Thus, the goals of both protection and scientific inquiry are served by these activities.

In the same way, providing opportunities for people to walk into the landscape, to discover a special piece of petrified wood or a fossilized bone, to hold it in their hands, and to understand its history may enhance people's appreciation of what these objects represent, and strengthen their sense of connection with the Earth. In the long term people's sense of being a part of the Earth may be the only thing that can ultimately protect it. A simple positive and symbolic commitment can be made by visitors to Petrified Forest by choosing to leave the park exactly as

they found it, foregoing the temptation to keep small pieces of souvenir petrified wood. Thus, the goals of both protection and a quality visitor experience are served by bringing resources and people together.

Scientific inquiry and visitor use can also be complementary goals. Many people are fascinated by the opportunity to watch researchers at work, and seeing where a fossil skeleton came out of the ground and how it was prepared for exhibit can greatly help people put static exhibits into a broader ecological context. Science, for its part, benefits from increased public interest and support.

Management Zoning

With the exception of two new development sites, the existing management zoning outlined in the 1987 *Statement for Management* is consistent with the goals and actions included in the proposal. The zones are described below.

Natural Zone

Ninety-nine percent of the park (92,890 of the park's total 93,533 acres) is in the natural zone. This zone is comprised of lands that remain largely unaltered by human activity except for minor developments essential for management, use, and appreciation of the park. An area of 50,260 acres of designated wilderness is included as a wilderness subzone in the natural zone (see the Geographic Areas map for the wilderness subzone boundary).

Historic Zone

The eight historic and prehistoric properties listed on the National Register of Historic Places are included in the historic zone. This zone totals 543 acres.

Development Zone

The developed zone currently includes two areas, the Painted Desert headquarters site and the Giant Logs developed area. This zone will be

expanded to also include a proposed visitor facility site on Tiponi Point and a proposed new housing and maintenance site on the mesa top northwest of Giant Logs. Together these sites will total less than 100 acres.

Visitor Experiences

People visiting Petrified Forest are first impressed by the aesthetic aspects of the park—the grand vistas of stark desert landscapes, the changeable weather and its visual effect upon distant horizons, and the exotic beauty of the colorful petrified wood. If they wander short distances from their cars, they might discover a fossil bone, a pedestal log, or a petroglyph etched on a cliffside. In the absence of a holistic framework for understanding what they see, most visitors experience the park as a collection of seemingly unrelated natural and cultural oddities. A major challenge of this plan is to take visitors from this perspective to an understanding of the Triassic period of Earth's history and what it represents to us today. The programs and facilities included in this plan are intended to orient visitors to what they can see and do in the park, to provide opportunities for sensory and discovery experiences, and to place the resources of the park into the context of Earth's history.

The three geographic areas of the park—Painted Desert, the Puerco River valley, and Rainbow Forest—lend themselves differently to the various aspects of the visitor experience. The plan capitalizes on these differences to provide visitors with a rich and varied journey through the park.

Painted Desert: Geological and Paleontological Overview

Background

The Painted Desert, with its expansive vistas, is an ideal setting for providing visitors with the big picture. Currently about 65 percent of the park's visitors enter here, at the north end of the park, and they need information and interpretation of what they are about to experience at Petrified Forest. Many visitors coming off the interstate also need restrooms and food service. Currently about 25 to 30 percent of the people using this entrance choose to go no farther into the park than the visitor center, which was designed to

serve as an interstate highway regional information station. This first stop provides no sense of entry into a unique natural area and it offers little interpretation of the park's outstanding resource values. The major visitor experience in this part of the park is along the Painted Desert rim drive, where people can pull off at several scenic viewpoints and enjoy the vistas with some interpretation of geologic features and processes provided by wayside exhibits.

Proposal

The famous views of the Painted Desert would provide an excellent focus for interpreting a geologic perspective on time and the fact that the landscape visible today is a manifestation of events and life-forms that occurred 230 million years ago. Thus, rather than focusing on particular features of the past or present, interpretation in the Painted Desert unit would emphasize Earth processes and phenomena, such as continental drift, paleoecology, evolution, fossilization, and uplift and erosion. Visitors' understanding of these concepts would greatly enhance their understanding and appreciation of the interrelated resources of the park. Effectively conveying these complex ideas would require media presentations and a new visitor center at Painted Desert. The visitor center would be relocated about a mile farther into the park, to Tiponi Point, where all visitors, including the 25 to 30 percent who did not travel beyond the visitor center, could have a better arrival experience. Tiponi Point overlooks a small arm of the Painted Desert, where visitors could enjoy scenic vistas, without being visible from the main section of the desert floor. A visitor center at this location would remove visitors from the distractions of the I-40 corridor, give them a view of the Painted Desert, and allow immediate access to scenic walks along the rim or down to the desert floor.

Various interpretive media in the visitor center would help people understand how the modern landscape and its inhabitants reflect changes in

climate, landforms, and life-forms over eons of time. Visitors would learn that the Triassic period was a time of major transition, and that the life-forms from that period, which at first might seem completely alien, carried the seeds of life on Earth today—including our own. Although interpretation at the Painted Desert visitor center would focus on geology and paleontology, it would also provide an overview of all the park's interpretive themes, including archeology, regional native American lifeways and arts, desert and prairie environments, wilderness, and historic and modern uses of the Puerco River valley as a transportation corridor.

Interpretation would also cover the scientific process as it relates to the research occurring in the park. Because of the park's great untapped research potential, it would be a disservice to visitors to present a comprehensive picture of the Triassic period as if scientists knew everything about it—when, in fact, new discoveries are being made every year. Visitors would be invited to experience some of the excitement associated with research in the park by making part of a proposed new research facility open to public viewing and by offering tours of excavation sites when field work was being conducted. The new research facility would also become a center for a growing partnership with local schools. (The proposed research center is discussed in the next section of the plan.) A similar interpretive emphasis would be placed on the scientific importance of the park's archeological resources, although most archeological research would continue to be based out of the Western Archeological and Conservation Center in Tucson.

A concession would continue to offer meals, light refreshments, and gift sales. This facility would be rebuilt near the visitor center. Petrified wood would no longer be sold in the park gift shops. Visitors would be asked to enjoy the wood and other fossils nonconsumptively in their natural settings. Helping visitors understand the origins and age of the petrified wood and other fossils in the park, and also their value to science, would help them understand and respect the federal prohibitions against taking these objects from the park.

Within 15 minutes visitors following a new trail from Tiponi Point could find themselves in another world free of the sights and sounds of automobile traffic and development. Although people must carry water, the Painted Desert is an easily accessible wilderness, and novices as well as experienced wilderness users could enjoy a primitive hiking experience across fascinating badlands. The new trail in conjunction with the existing Painted Desert trail from Kachina Point would allow visitors to descend or ascend the escarpment at either location. Better information and orientation at the park entrances and additional signing would make visitors more aware of these and many other opportunities to leave the road and hardened trails and to discover the park on their own.

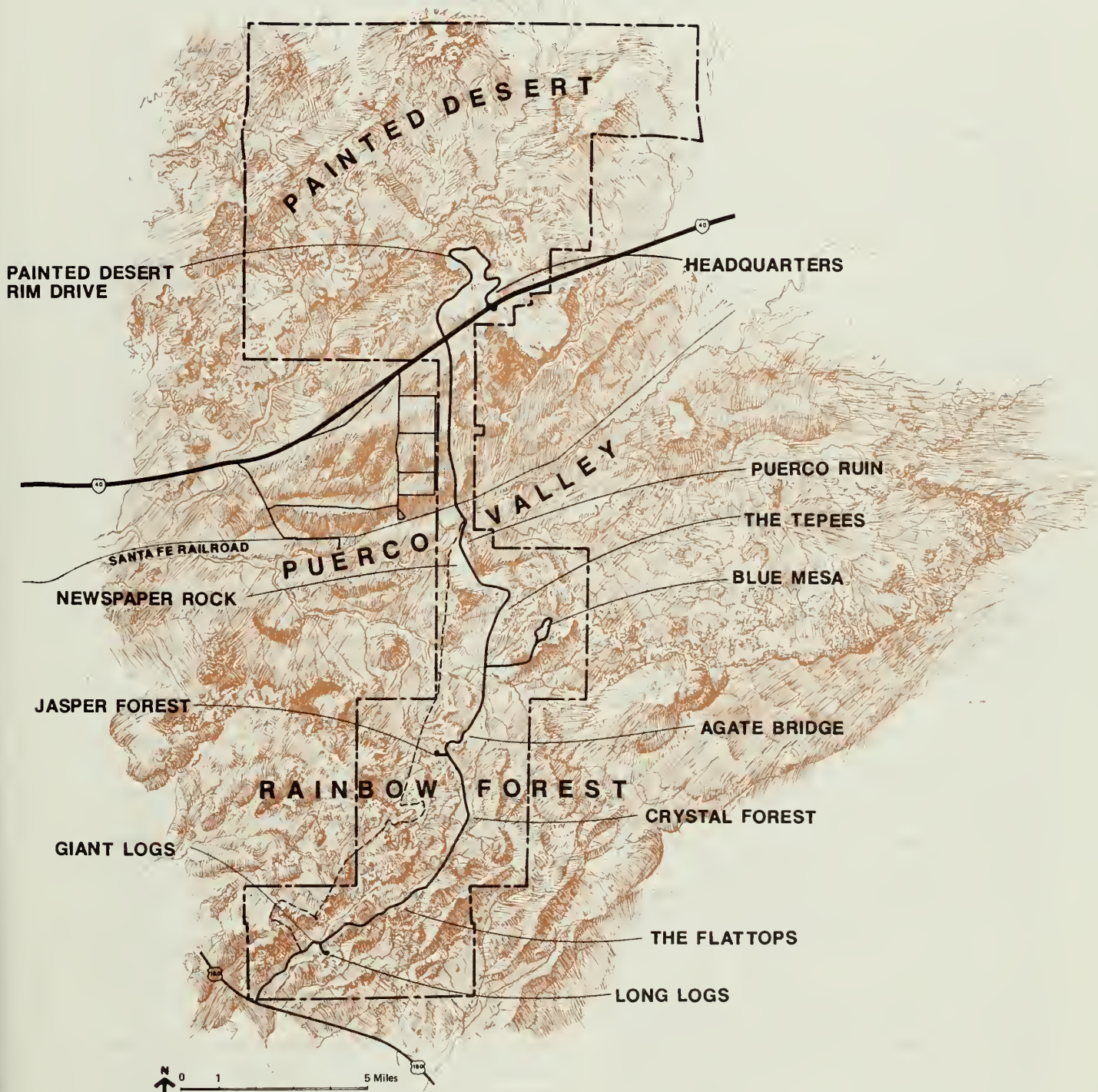
From Tiponi Point visitors would continue along the Painted Desert rim past a series of seven more pullouts. Interpretive waysides now in preparation would address topics such as prominent geologic features, air quality, and hiking opportunities.

At the Painted Desert Inn National Historic Landmark on Kachina Point visitors would be introduced to southwestern culture through interpretation of the structure itself, exhibits of native American art, and cultural demonstrations. The Petrified Forest Museum Association, the park's cooperating association, would manage the cultural demonstrations and operate a small sales outlet in one of the inn's rooms.

The wide ledge at Chinde Point would be used for picnicking, interpretive activities, and scenic viewing. The fact that this viewpoint is removed somewhat from the main traffic flow makes it quieter than the other pulloffs, and its size offers an opportunity to create relaxing settings where visitors might want to spend some time enjoying the views. A wayside exhibit would interpret the site of a significant dinosaur excavation, visible from this overlook.



PAINTED DESERT RIM DRIVE



POINTS OF INTEREST

Puerco River Valley: Man and the Environment

Background

The Puerco River valley, man's habitation zone, best speaks to the modern landscape and the continuation of life in the present. Interpretation in this zone is currently limited to early human occupation, but this story could be expanded to the present day, enhancing visitors' awareness of their complex relationship with the Painted Desert environment.

Proposal

A new pulloff and wayside would be provided at a vantage point just south of Lacy Point where visitors could see the shortgrass prairie and the remnants of old US Route 66 paralleling the new alignment of I-40—a good visual representation of the historic and continuing use of this valley for transcontinental travel. Additional interpretation of the valley's use as a transportation corridor would occur at another new wayside overlooking the railroad tracks near the Puerco ruins.

The Puerco ruins would be the focal point for interpreting prehistoric people's use of the area. An overview of the park's archeological resources would be provided at a visitor contact station near the ruins, and visitors would be invited to explore the ruins and nearby petroglyphs following a self-guiding interpretive trail. Interpretation would emphasize the scientific value of the park's archeological resources and the importance of protecting them from vandalism and theft. The petroglyphs on Newspaper Rock would be interpreted from the existing overlook using improved viewing devices and wayside exhibits.

Rainbow Forest: Close-up on Fossils

Background

The Rainbow Forest area offers wonderful opportunities to experience fossils on an intimate scale. Here, the park road cuts across the floor of the badlands, and travelers are surrounded by the colored strata of the Chinle formation. Petrified wood, other plant fossils, and fossilized bones and shells representative of a broad cross section of species from the Triassic forest ecosystem are readily visible and touchable. About 35 percent of all visitors enter the park from the south and need orientation and information.

The developed area at Giant Logs (previously called the Rainbow Forest developed area) is currently dominated by a large concession building, which attracts visitors' attention away from the smaller, less prominently located visitor center. In fact, people driving into the area from the south entrance station often do not see the visitor center because it is behind them as they enter the parking lot. The concession operation duplicates the gift shop services available immediately outside the park boundary, less than 2 miles from the visitor center.

Proposal

Interpretation in the Rainbow Forest area would depend heavily on on-site personal services to help visitors see the park's many manifestations of the Triassic period and to protect the fossil resources from theft and inadvertent destruction.

Basic park information and orientation would be provided at the Rainbow Forest visitor center. However, the interpretive theme would be different from the theme in the north. Here, interpretation would explore the details of the Triassic ecosystems. Through its cooperative program with the University of California, the park has acquired four excellent casts, which could be incorporated into a life-size diorama helping visitors imagine the petrified logs and other fossils as integrated parts of living systems. The

media used in this exhibit should be flexible enough to allow for updating when discoveries expand the knowledge of this scene. Other exhibits would highlight some of the fossils found in the park, placing the petrified wood in the context of being one of many kinds of fossils visible here. In addition to evoking a 230-million-year step back in time, the visitor center would serve as a staging area for self-guiding and guided tours of the surrounding petrified wood sites and fossil beds. The existing visitor center would be remodeled to adequately accommodate the visitor services and interpretation needed at this end of the park.

In the future less emphasis would be placed on Giant Logs (previously the focus of the Rainbow Forest development) and more emphasis would be placed on Long Logs as the primary visitor attraction in this part of the park. Long Logs is a less disturbed resource and a more fitting introduction to the park. A new trail would lead from the visitor center to Long Logs, and visitors would be encouraged to walk out to that area and to discover the resources there as part of a leisurely recreational experience.

Giant Logs, where the views encompass petrified logs in the foreground and the cliffs of the Chinle formation as a backdrop, would be redesigned as a self-guiding outdoor exhibit interpreting the formation and erosion of petrified wood. Giant Logs is also a highly scenic area for viewing sunsets, and the park staff could offer sunset tours before closing the park at the south end. Additional evening outreach programs could be provided for people staying in the commercial campground just outside the park.

The park concession operation at this end of the park would be limited to light refreshments and relocated to a smaller building. The commercial services outside the boundary should adequately serve visitors and would not be duplicated.

The wilderness trailhead at the Flattops, which is currently the first stop north of Long Logs, would be closed. This action would be taken to protect sensitive archeological sites, which are being degraded by the relatively heavy use facilitated by easy access to the Flattops.

The Crystal Forest area would continue to be managed for intensive use. Interpretation would concentrate on the petrification process and the variety of minerals formed, including the exquisite crystals concentrated in this area.

Jasper Forest would be retained as an accessible wood area with no developed trails. Visitors could view the area from the overlook or wander over the wood-littered landscape. Interpretation would stress the historic theft and destruction of the wood in this area, which was worse here because of the proximity of the railroad.

The Blue Mesa area has great recreational value. Visitors could follow the existing paved trail into the badlands or explore the untrailed but easily accessible hills and gullies. A new unpaved trail would connect Blue Mesa with the Tepees area, providing another opportunity for visitors to experience the badlands and their fossil resources. Picnic tables and restrooms would be provided to support longer stays by visitors in the Blue Mesa area. The facilities would be placed where they would not be visible on the skyline.

Many of the vertebrate fossils discovered in the park have come from the Tepees area. A wayside here would interpret the weathering of the badlands formations and the subsequent uncovering of Triassic fossils. For visitors coming from the north, the Tepees would be the first stop in the Rainbow Forest geographic area, and the theme for this area would be established by the exhibit of a partially excavated phytosaur skeleton. To avoid misleading visitors about the authenticity of the skeleton, it would be frankly presented as a reproduction for the purpose of display. Even in this context, however, it would provide a strong first impression of the interpretive theme for this area.

Petrified wood is by far the most easily identifiable fossil in the park. The general public could walk right over the top of most other fossils and not even see them. Guided tours throughout this unit would allow for visitors to experience these resources while providing for maximum resource protection. Also, public tours of research work sites would be arranged wherever

possible. A major objective in this part of the park would be to share the excitement of discovery with park visitors, helping them to appreciate the significance of the park's resources and stimulating them to learn more about those resources.

Park Wilderness

Only a small percentage of park visitors actually enter the wilderness. Still, overnight camping in wilderness has slowly increased from 240 overnight stays in 1973 to 682 in 1990. Both wilderness areas would remain open to day use and overnight camping. Other backcountry areas in the park would be open to day hiking only. Backcountry service roads would continue to be restricted to official use only.

Projected Visitor Use

Petrified Forest is a nondestination "drive-through" park and is expected to remain so into the foreseeable future (Kemper 1989). The level of park use has been increasing at an average of slightly more than 2 percent per year for the past decade (see table 1). The annual variations around this norm are attributable to such external variables as gasoline prices, regional economic conditions, and package tour itineraries.

Assuming that the current growth rate continues for the next decade, visitor use would increase by approximately 25 percent, to just under 1 million visits per year by 2000. The addition of improved visitor centers, the research center, and better picnic facilities, combined with a greater emphasis on interpretation, would be expected to substantially increase the average visitor's length of stay, but the majority would still stay only part of a day.

The facilities needed to implement the visitor use proposals would be designed to accommodate the projected use levels with no adverse impacts on natural or cultural resources. Pulloffs and trailheads along the main park road would be designed to accommodate a 25 percent increase in use. The capacities of the two visitor centers

**TABLE 1: PARK USE LEVELS
1980-90**

YEAR	VISITS	CHANGE
1980	686,700	+ 2%
1981	751,400	+10%
1982	714,200	- 5%
1983	712,100	- 1%
1984	718,400	+ 1%
1985	740,300	+ 3%
1986	764,900	+ 3%
1987	771,300	+ 1%
1988	872,100	+13%
1989	838,800	- 4%
1990	860,699	+ 3%
10-year average		+ 2%

would be based on the following assumptions.

Painted Desert Visitor Center

Currently about 40 percent of all park visitors stop at the Painted Desert visitor center (see table 5 in the "Affected Environment"). This percentage would be expected to increase considerably once a visitor center/research center interpretive program was developed. Based on projected visitor use levels and experience at other parks with major interpretive centers, it is projected that approximately 700,000 people per year would visit the new center (approximately two-thirds of the projected 1 million visitors). Based on existing use patterns (table 4) slightly more than 50 percent of these visits would occur during the 92-day period between June 1 and August 31, for an average of approximately 4,000 visitors per day over the summer season. Based on these projections, the Painted Desert visitor center should be designed to accommodate approximately 400 people at one time.

Rainbow Forest Visitor Center

The Rainbow Forest visitor center currently attracts approximately 20 percent of all park visitors. This percentage might increase to

approximately 25 percent as a result of proposed improvements to the interpretive program; however, this center would remain secondary to the Painted Desert center, both because more people would continue to enter the park from the north and because the Rainbow Forest center would be oriented to the smaller percentage of visitors desiring a more leisurely park visit. Based on these assumptions it is estimated that about 250,000 people per year would visit the Rainbow Forest visitor center (approximately one-fourth of the projected 1 million visitors). This would equate to about 1,500 visitors per day during the

peak summer months and a design capacity of about 150 people at one time.

Recommended Studies

The following additional studies and plans would be required to implement the proposal for visitor use:

- interpretive prospectus (revise existing plan)
- wayside exhibit plan (revise existing plan)

Resource Management and Research

The park's paleontological, cultural, and natural resources have considerably different management requirements. The critical concerns for each type of resource are summarized below.

The Triassic fossils are nonrenewable resources. Once the remainder of the Chinle formation erodes away, the source of these fossils will be gone. The theft of petrified wood is the park's number one resource protection problem. Petrified wood is continuously eroding out of the Chinle formation, but the rate of replacement is so slow that it is meaningless in human terms of time, and areas along the road and trails that once were littered with brightly colored chips of petrified wood – the accumulation of the ages – have been picked clean. Visitors must be convinced to leave the petrified wood undisturbed if future generations are to benefit from its educational and aesthetic values.

Unlike most other nonrenewable resources, the park's vertebrate fossils cannot be preserved by leaving them alone. Preservation of fossilized bone requires excavation, preparation, and protected storage. Otherwise, as the fossils erode out of the ground, their exposure to the elements causes them to oxidize, disintegrate, and relatively quickly be washed away in storm runoff. Indeed, large skeletal remains begin to break up even before they are exposed at the surface, so their preservation depends on early detection and subsurface excavation. The significance of the park's Triassic vertebrate fossils warrants an intensive research program to find and protect these resources.

Archeological resources are usually best protected by leaving them undisturbed. Consequently, the collection of buried cultural artifacts is generally limited to instances when they must be removed to protect them from construction activity or other unavoidable ground-disturbing activities or natural phenomena. The park's archeological resources need to be surveyed and evaluated as a basis for management decisions.

Historic structures are best preserved in their present condition if that condition allows for satisfactory protection, maintenance, use, and interpretation. Badly deteriorated buildings need to be rehabilitated to a maintainable condition to ensure their long-term preservation. Using structures for compatible activities helps protect them from neglect and vandalism.

The park's natural resources need protection from air- and water-borne pollutants, habitat destruction, and invasion by alien species. Known threats include vegetation trampling and erosion caused by foot traffic at turnouts and viewing areas, and invasions of alien Russian thistle and tamarisk (also known as salt cedar). Trespass grazing would be a potential problem along the eastern boundary if sheep were brought onto the range adjacent to the park as currently planned. Plant and animal populations need to be inventoried and monitored to detect other potential threats and to provide the necessary data for identifying appropriate protective management strategies.

Specific management issues and strategies are described in the park's *Resource Management Plan*. That plan would be updated as necessary to direct the implementation of the following management concepts.

Paleontological Research

Background

Paleontological research in the park began in earnest in the early 1920s, when Professor Charles Camp of the University of California was attracted by news of discoveries of phytosaur and metoposaur fossils by amateur paleontologists. Over the next decade and a half Camp conducted systematic surveys of vertebrate fossils, which he documented with extensive field notes and photographs. Camp shipped tons of fossilized bone to the Berkeley campus, establishing the foundation for the

university's world-class Triassic vertebrate collection.

Berkeley professors and students have maintained close ties with the park and frequently undertake field work there. A major part of the park's collection, including significant paleontological specimens, is located at the Berkeley Museum of Vertebrate Paleontology. Other academic institutions that have sponsored field work in the park and that are major repositories of fossils excavated from the Petrified Forest member of the Chinle formation are the Smithsonian Institution, the American Museum of Natural History, the University of Colorado, Weber State University, Arizona State University, Northern Arizona University, the Museum of Northern Arizona, and the New Mexico Museum of Natural History.

In spite of seven decades of active paleontological research, as late as 1981 only about 40 Triassic plants and a handful of Triassic animals were known from the park. Just recently, however, there have been dramatic additions to the park's information base. Now about 148 species of plants and 50 animals are known, and paleontologists are better defining the topography and climate of the Triassic period. Because Petrified Forest contains the most important accessible exposure of Triassic rock in the world, the research here is of global significance to paleontology, and also to geology (notably to the discipline of sedimentology). It may also prove to be of global importance to biology. Some of the most astounding discoveries of the 1980s have been of organic plant and animal material, including proteins, dating from a hundred million years ago. Organic material such as amber and structural organics have been found in petrified wood in the park, but none of it has had the diagnostic proteins and nucleic acids found in younger fossils. Additional discoveries are undoubtedly forthcoming in this field of study.

Little paleontological research is initiated or funded by the National Park Service. Most is accomplished by outside institutions who request and receive NPS research permits. Through the permit process, these institutions agree to publish their findings and to provide the National

Park Service with information it can use in resource management and interpretation in exchange for the opportunity to excavate and study park resources. The park has recently hired a paleontologist/curator to oversee the museum collections and to coordinate research in the park. The park staff has the counsel of an advisory group made up of noted paleontologists from several regional institutions with an interest in the Chinle formation and it coordinates closely with cooperative park studies units at the University of California at Davis (the closest CPSU to the paleontological center at Berkeley) and Northern Arizona University (the regional CPSU serving the park).

Such arrangements have proved relatively successful over the past decade, in large part because of the dedication of the individuals involved. One notable success is the cooperative agreement between the park and the University of California at Berkeley, through which the park has received skeletal reconstructions of four Triassic reptiles. These mounts are the only ones of their kind and greatly enhance the park's world-class interpretive value.

The National Park Service retains jurisdiction over all the park's collections, no matter where located, and ensures they are managed according to NPS policies and guidelines (*NPS Management Policies, Natural Resources Management Guideline, Cultural Resources Management Guideline, and Museum Handbook*). The Park Service can direct that collections be relocated to another appropriate institution if the original institution violates the terms of its permit. Thus, the long-term preservation of the fossils removed from the park is ensured.

However, a research program as it is being conducted in the park also has significant disadvantages. An obvious problem is the inefficiency of an uncoordinated program of unrelated efforts by multiple institutions. The fossils in the park collection are scattered and not easily accessible as a group for comparative studies. Another problem is the often incomplete and sporadic return of information to the National

Park Service and the public—who should be the ultimate beneficiaries of these public resources.

Proposal

Recognizing the global significance of the park's paleontological resources, the National Park Service proposes to establish a research center in the park to direct the scientific inquiry into the Triassic environment of the Chinle formation. The center would allow for coordinated, long-term research activities, such as quarry operations in the bone beds, and it would provide the facilities needed to care for park resources on site. A research plan, scope of collections statement, and collection management plan would be prepared to establish goals and direct specific research, collection, and curatorial activities. Programs funded through the center would ensure that research conducted in the park would benefit park management and interpretive programs as well as the science of paleontology.

The proposed research center would consist of a preparation lab, where specimens brought in from field excavation sites could be professionally prepared for study and storage, a collection storage area for a comprehensive comparative collection, a library, a common work space for visiting researchers, a large meeting room, classrooms, and offices for the center staff. Minimal staffing needs for the center would be a director (PhD paleontologist), a curator/collections manager, a conservator, a computer technician, and a secretary. The paleontologist/curator now on the park staff and all responsibilities for the park museum collections would be transferred to the research center.

One of the primary purposes of having the center in the park would be the opportunity it would provide for interpreting the park's research to visitors. A bank of windows in the preparation lab would allow visitors to view work in progress, and guided tours might also be conducted. The accessibility of the research center to park visitors would greatly enhance their awareness and appreciation of the park's research values and help them understand the relationships

among the park's scenic, geologic, and paleontological resources.

Such a facility could serve as a center of excellence for paleontological research in the national park system. The center's programs could be expanded to serve some or all of the 33 other NPS units with paleontological resources.

The center could also serve as a centerpiece for the park's environmental education program, thus benefitting local, rural Arizona schools. Other compatible uses of the center would include conferences, workshops, interpretive programs, and work space for visiting researchers in other disciplines.

Petrified Wood

Background

Three kinds of petrified wood erode out of the Chinle formation. The most common, *Araucarioxylon*, was recently designated the Arizona state fossil. The Chinle formation currently ranges from several hundred feet to less than 100 feet in depth, and it appears to be eroding at a rate of 2.5 to 5.7 millimeters a year.

An estimated 12 tons of petrified wood are stolen from the park each year, mostly in small, easily carried pieces taken from the Rainbow Forest area (NPS 1986c). The temptation to steal wood is being encouraged by the sale of petrified wood for high prices at gift shops throughout the region. Two private gift shops immediately outside the south park boundary and concessioner-operated gift shops at both park entrances sell petrified wood. Thus, many visitors' first impressions of this park resource are of its commercial value and usefulness for bookends and jewelry. As the quality and quantity of commercially available petrified wood decreases, the potential for major wood theft in the park will increase.

Various methods of preventing the theft of petrified wood have been attempted. Free samples (purchased from commercial sources) have been given to visitors as they exited the

park. Uniformed personnel have been stationed at high-theft sites during the peak travel season, and frequent patrols by both on-foot and horse-mounted rangers have been scheduled. Car searches have been conducted. And letters from people who took wood from the park and later returned it have been exhibited in the visitor center. Park managers agree that on-site interpretation and ranger patrols seem to be the most effective known methods of reducing wood theft.

Proposal

Considerable emphasis would be placed on helping visitors understand the significance of the wood and the importance of preserving it in the park (see "Visitor Experience"). A long-term evaluation and monitoring program would be implemented to determine the extent and nature of petrified wood theft, vandalism, and site erosion and to set priorities for protective measures. Four patrol rangers would be added to the park staff to increase patrols in high theft areas. In an effort to discontinue giving a mixed message to visitors about the appropriateness or inappropriateness of taking significant resources from the park, petrified wood would no longer be sold inside park boundaries.

The Shortgrass Prairie Ecosystem

Background

The destruction of the shortgrass prairie ecosystem as a result of overgrazing, drought, and floods during the late 1880s and early 1890s changed the face of northern Arizona. Overgrazing is still evident over much of the range, and erosion continues to deepen steeply incised gullies. Satellite photos show that the park is the only area in northeastern Arizona where the shortgrass prairie has made a substantial comeback. Vegetation density is noticeably greater immediately inside the park boundary fence. Although the shortgrass prairie will never fully recover to its pre-1880s species composition, it will come closest to recovery within the park.

All ground disturbances in the past, even when revegetated with native species, have resulted in at least a temporary proliferation of weedy annuals, such as Russian thistle, cheatgrass, and sunflower. Regeneration of native grasses is slow, and in the case of roadside revegetation projects is expected to take three to seven years before native species stabilize disturbed areas.

Proposal

Management would seek every strategy feasible to ensure continued recovery of the shortgrass prairie ecosystem. Language identifying the importance of the shortgrass prairie would continue to be included in park planning documents, such as the *Statement for Management* and the *Resource Management Plan*. Resource base inventories would be completed as funding was available. Range conditions and their correlation with wildlife populations would be monitored. Areas of concentrated human activity would be monitored to identify changes in species composition, and action would be taken to eliminate or mitigate adverse effects on natural biological processes. Such action would include revegetation of all areas disturbed by foot or vehicle traffic and monitoring of vegetative recovery rates. An integrated pest management plan would be developed, and alien plant species would be removed wherever practicable. The boundary would remain fenced to protect native plants and animals from the adverse effects of grazing by trespassing livestock. Fencing would be of an appropriate type to allow for unrestricted movement of pronghorn.

Species of Special Concern

Background

No federally or state-listed threatened or endangered wildlife reside in the park, although American peregrine falcons (*Falco peregrinus anatum*) and southern bald eagles (*Haliaeetus leucocephalus leucocephalus*) occasionally pass through on their seasonal migrations. The black-footed ferret (*Mustela nigripes*), listed as

endangered on both federal and state lists, possibly existed within the Petrified Forest area at one time but has now been extirpated throughout the state.

Two known rare plants inhabit the park. Gladiator milk vetch (*Astragalus xiphoides*), a category 1 candidate for threatened status on the federal list of threatened and endangered plants (USFWS 1989), occurs in 15 populations in the park extending from Chinde Mesa southward through Lithodendron Wash to Blue Mesa, Agate Bridge, and Crystal Forest. An inventory of these populations conducted in 1988 and 1989 estimated that they contained a total of about 5,000 individuals. Paper-spined cactus (*Pediocactus papyracanthus*), a category 2 candidate, occurs in fine sandy clay loam soils on open flats between 5,000 and 7,200 feet in the pinyon-juniper woodlands of Navajo County and eastward into New Mexico. Two localities are known within the park, both in the Rainbow Forest area, well away from any present or proposed development. No rare plant population surveys have been completed for this species. See appendix B for references to consultation with the U.S. Fish and Wildlife Service.

Proposal

The National Park Service would consult with the U.S. Fish and Wildlife Service to consider the feasibility of reintroducing black-footed ferrets into the park as part of a regional recovery effort.

Surveys would be conducted at the appropriate times of year to inventory likely habitat for rare plants. Known populations of gladiator milk vetch and paper-spined cactus would be monitored. The facilities at Agate Bridge would be redesigned to increase the protection of a population of gladiator milk vetch.

Fire

Background

The shortgrass prairie and desert shrub communities are sparse enough that the

vegetation does not carry wildland fire any great distances.

Proposal

Where fire threatened life, property, or cultural resources, it would be suppressed by personnel using fire trucks and other equipment. In natural areas of the park where life, property, and cultural resources were not threatened, wildland fire would be contained by indirect suppression methods (use of roads or natural firebreaks, such as barren areas, rimrock, and dry washes). All fires would be controlled with suppression techniques that caused the least damage to natural and cultural resources. Such actions would be compatible with the park's *Fire Management Plan*.

Wilderness

Background

Two areas of the park are designated wilderness. The Painted Desert wilderness consists of 43,020 acres located in the northern portion of the park. The Rainbow Forest wilderness lies in the southeast portion of the park and consists of 7,240 acres. Viewshed protection has become an issue for both wilderness units. Subdivision activity has occurred along the southwestern corner of the Painted Desert unit north of I-40. Views from the Painted Desert rim drive now include a scattering of white, double-wide trailers visible on the horizon and at the bases of the mesas, marring the spectacular scene of the Painted Desert. The western boundary of this unit is about a mile short of the natural viewshed divide where the land slopes westward toward Holbrook out of view from the park road.

The Rainbow Forest unit is extremely narrow in places, at one point no greater than 600 yards, because of limits imposed by the park road and the east park boundary. The open spaces east of Agate Bridge and the Flattops and south of Long Logs are integral to the wilderness experience of this unit but lack protection for wilderness values.

Proposal

A study would be conducted to assess viewshed intrusions and other impacts that are diminishing the values of naturalness and solitude of the park's designated wilderness. A suitability review would explore the possibility of redrawing the Rainbow Forest unit boundary to parallel the park road and to include the southwestern corner of the park. When the existing wilderness boundary was established, US 180 cut through the southwestern corner of the park. Since that time the highway has been realigned south of the park boundary. The removal of the highway and revegetation of the corridor could qualify this area for addition to wilderness, thereby increasing the protection for the viewshed and bone beds south of Long Logs.

Consideration should be given to redesignating the two units of the Petrified Forest wilderness as the Painted Desert wilderness and the Rainbow Forest wilderness, two separate units of the national wilderness preservation system.

Air Quality

Background

In 1977 the Clean Air Act was amended to prevent significant deterioration of air quality in clean air areas of the United States. Among the stated purposes of the amendments was "to preserve, protect, and enhance the air quality in the national parks." Petrified Forest National Park was designated a mandatory class I area, where very little additional air pollution would be permitted.

Under the Clean Air Act, the federal land manager (the assistant secretary of the interior for fish and wildlife and parks) and the park superintendent have an affirmative responsibility to protect the air-quality-related values of the park from adverse air pollution impacts. Air-quality-related values include visibility, plants, animals, water quality, historic and cultural resources, and other resources that could be degraded by air pollution.

The outstanding air quality at Petrified Forest National Park is recognized as a significant park resource. Colorful panoramas and clear, long-distance vistas such as those visible along the Painted Desert rim and at Blue Mesa are considered to be primary visitor attractions.

Existing air pollution in the park comes from both natural and anthropogenic sources, such as windblown dust, wood and coal burning for home heating, lumber mills, coal-fired power plants, copper smelters, and long-range transportation of urban pollution. The park is currently conducting visibility, ambient air quality, and meteorological monitoring. The deterioration of air quality is a major concern identified by the park staff.

Proposal

The park staff would establish a data base of air quality and related values adequate to comply with the requirements of the Clean Air Act to protect and preserve the scenic quality of the park and air-quality-related values. The air quality program would include research on pollutants and their effects upon the park's natural and cultural resources. The park should be represented on the regional air transport commission called for in the 1990 amendments to the Clean Air Act.

Archeological Sites

Background

The park contains more than 500 recorded archeological sites dating from the first millennium B.C. to historic Navajo and Euroamerican times. Some isolated artifacts date prior to 6,000 B.C. Most prehistoric sites are Anasazi, but some are associated with the Mogollon and Sinagua cultures. Archaic, Basketmaker, and Puebloan periods are all represented. The quantity of Puebloan sites and the frontier nature of the sites, reflected by the blending of surrounding cultures, are significant. Six prehistoric sites or districts are listed on the National Register of Historic Places (the

remaining sites have not been evaluated for the register):

Painted Desert Petroglyphs and Ruins
Archeological District
Newspaper Rock Petroglyphs Archeological
District
the Agate House pueblo
Twin Buttes Archeological District
the Flattops site
the Puerco ruins and petroglyphs

Agate House, the Puerco ruins, the Twin Buttes district, and two prehistoric masonry structures in the southern part of the park are on the List of Classified Structures.

Most of the park's archeological resources are in remote locations, but some are near existing or proposed developed sites, where they are potentially threatened by excavation, foot and vehicle traffic, and other ground-disturbing activities. Rapidly escalating market prices for prehistoric artifacts are making all resources—even those in remote locations—more susceptible to theft. Pot hunting has occurred within the park boundary. The Flattops archeological site, listed on the national register, is being adversely affected by foot traffic and probably by removal of artifacts.

Archeological research in the park is conducted by the NPS Western Archeological and Conservation Center in Tucson, and most of the park's archeological collection is managed by the center's Museum Collection Repository. Recent surveys conducted since 1978 in compliance with sections 106 and 110 of the National Historic Preservation Act have nearly doubled the number of sites recorded previously, when survey methods were much less intensive and certain types of sites, such as rock art, lithic scatters, and quarries, were not recorded. Since 1978 a total of 28,438 acres (30 percent of the park) have been inventoried. A large portion of the unsurveyed area is north of the Painted Desert rim drive, where few cultural resources are expected to be found. Modern methods of intensive coverage and site documentation have provided management with accurate and complete data on which to base decisions

regarding planning, resource preservation, research requests, and public education.

Proposal

The park's archeological sites would be managed through a proactive program of conservation, protection, public education, and interpretation. A planned, phased research program would be initiated to complete the park's cultural resource data base. A research design would be prepared to guide this program. Some of the research needed to learn about the prehistoric peoples who inhabited the park could be accomplished as part of scientific studies conducted for multiple purposes. For example, agricultural rock alignments might be identified from low-level aerial photography used for vegetative mapping. All the park's research projects would be closely coordinated to ensure maximum data benefits. Archeological research in the park would continue to be conducted by the NPS Western Archeological and Conservation Center in Tucson. Suitable support facilities in the proposed new research center would be available to all field scientists.

Cultural resources would be evaluated, and those that appeared to be eligible would be nominated to the National Register of Historic Places. The scope of this evaluation would include resources associated with early paleontological research. Because of the widespread distribution and density of archeological sites throughout the park, consideration would be given to nominating the entire park for listing on the national register and perhaps for national landmark designation.

The ongoing evaluation/monitoring program would be continued and expanded to determine the extent and nature of looting, vandalism, and site erosion. Priorities for protective measures would be established based on site significance, integrity, and vulnerability.

The parking pulloff, wilderness trailhead, and trail near the Flattops would be removed, and foot traffic would be greatly reduced in this part of the park, to help preserve this archeological site.

The Puerco ruins and petroglyphs and Newspaper Rock would be interpreted using techniques that would protect the resources.

The scope of collections statement would be updated, and a collection management plan would be prepared. A few selected artifacts would be retained at the park for interpretation. All others would be housed at the Western Archeological and Conservation Center.

The National Park Service would initiate cooperative agreements with private landowners, Indian tribes, and federal and state agencies to increase protection for related archeological resources outside park boundaries.

Historic Sites and Structures

Background

Two historic properties, the 35th Parallel route (Beale camel trail) and the Painted Desert Inn National Historic Landmark, are currently on the National Register of Historic Places. The inn, a former trading post and tourist stop, has been designated a national historic landmark in recognition of its historic and aesthetic qualities. The inn is a gracious old Pueblo Revival structure representing the intermingling of Old World European and New World native American architectural and decorative motifs. The inn, two adjacent structures, and a historic masonry Navajo structure in the Flattops area are included on the park's List of Classified Structures.

The pump house for well number one on the Puerco River is considered eligible for the National Register of Historic Places, and the concrete piers built by the Santa Fe Railroad in 1917 to support Agate Bridge may be eligible.

An abandoned portion of old U.S. Route 66 is still visible inside the park. Congress recently authorized a study of Route 66, "America's Main Street," to evaluate its significance and to explore options for preservation of the features associated with the route.

The following additional park structures were evaluated for possible inclusion on the National Register of Historic Places and were determined to be ineligible:

comfort station at Puerco ruins

comfort station at Agate Bridge

development complex near Giant Logs, consisting of the visitor center/ranger station (historically known as the museum building), park housing, maintenance structures, the concession building, and a concessioner duplex

Proposal

A historic resource study would be conducted to document the historic events that helped shape the landscape and to identify historic sites, structures, and objects. It would define historic contexts and significant themes for historic resources and their potential eligibility for the National Register of Historic Places.

The Painted Desert Inn National Historic Landmark would be rehabilitated and returned to use for interpretation of Southwest regional culture and of the structure itself. Regional art exhibits and native American cultural demonstrations would be routinely offered. The Petrified Forest Museum Association, the park's cooperating association, would operate a small sales outlet. A historic structure report was begun in 1991. A historic structure preservation guide, necessary for rehabilitation, would have a high priority for completion.

The two buildings across the road from the inn are in the same style and contribute to the ambiance of the historic scene. As mentioned, they are on the List of Classified Structures; however, they were not part of the 1975 nomination for listing on the National Register of Historic Places or the 1985 national historic landmark nomination. It is proposed that nomination forms for the inn be revised to include these structures and that the buildings be maintained as part of the historic scene.

The pump house for well number one on the Puerco River would be stabilized, but in the future it would be used only for storage.

The National Park Service would prevent any irretrievable impacts on the segment of Route 66 and any associated features within the park pending completion of the Route 66 study. All the elements of the corridor would be retained until the study recommendations were known. The traces of Route 66, the 35th Parallel route, and the Santa Fe Railroad tracks would be interpreted using techniques that would protect the resources.

Although not eligible for the register, the buildings at Giant Logs and the comfort stations at the Puerco ruins and Agate Bridge all contribute to the historic ambiance of the park. The comfort station at the Puerco ruins would be rehabilitated to serve as an interpretive facility for the area's prehistoric resources. The Agate Bridge comfort station would be retained and used for its current function. The exterior facades of both these buildings would be maintained to preserve the historic ambiance. At Giant Logs, all the existing buildings except the concession store and concessioner residence would be retained and adaptively used for a visitor center, ranger station, and new concession facility.

Ethnographic Considerations

Background

The park is adjacent to the Navajo Reservation. The relocation of approximately 2,500 people into the Navajo Newlands east of the park and the projected growth of the communities of Navajo, Chambers, and Sanders will create the need for a continuous, proactive dialogue between the park and the Navajo Nation regarding many aspects of natural and cultural resource management, interpretation, and boundary concerns. One Navajo structure, several corrals, and possibly some petroglyphs indicate historic Navajo use of the park.

The Hopi Reservation is some distance to the northeast. A new unit of the Zuni Reservation is also in the general region.

Proposal

The *Resource Management Plan* would outline ethnographic concerns and provide direction for special park uses by regional cultures. An ethnographic overview and assessment would be prepared.

Recommended Studies

The following additional studies and plans would be required for the management of natural resources:

- natural resource management plan (revise existing plan)
- paleontological inventory, evaluation, and monitoring plan
- paleontological research plan, scope of collections statement, and collection management plan
- rare plant surveys
- integrated pest management plan
- wilderness suitability study

The following studies and plans would be needed to implement the cultural resource management proposal:

- administrative history
- archeological research plan, scope of collections statement (revise existing), and collection management plan
- archeological surveys of proposed development sites
- cultural resource management plan (revise existing plan)
- ethnographic overview and assessment
- evaluation of resources associated with early paleontological research
- historic resource study
- historic structure report and historic preservation guide for the Painted Desert Inn and two outbuildings
- list of classified structures (revise existing list)

Park Operations

Budget and Staffing

The park's operations and maintenance budget for fiscal year 1990 is shown in table 2.

TABLE 2: ANNUAL BUDGET, FY 1990

DIVISION	ANNUAL BUDGET	FTEs
Administration	\$ 210,000	5.0
Operations (visitor services and resource management)	611,000	24.6
Maintenance – ONPS and cyclic	<u>650,000</u>	<u>19.6</u>
Totals	\$1,471,000	49.2

The following additional staff would be needed:

- Interpretation
 - interpretive specialist (GS-9)
 - 2 district interpreters (GS-7)
- Visitor Protection
 - 4 district patrol rangers (GS-5)
- Resource Management
 - biologist (GS-5)
- Research Center
 - paleontologist (GS-13)
 - collections manager/curator (GS-9)
 - conservator (GS-7)
 - computer technician (GS-7)
 - secretary (GS-5)
- Maintenance
 - maintenance worker (WG-7)
 - 2 maintenance workers (WG-5)
- Administration
 - project clerk (GS-4)

The annual cost of the above combined salaries based on step 5 of all pay grades equals \$392,000.

The staffing needs shown above are based on the existing park boundary. If the boundary was expanded to protect additional significant resources, staffing needs would increase.

Administration and Maintenance

Background

Most of the park's administrative and maintenance facilities are too small to adequately support the needed functions. In addition, the entire headquarters complex is structurally unsound. It was built in the 1960s under construction standards that were not adequate to compensate for the bentonite soils on the site, with the result that the foundations have heaved and the walls have separated. Recurring costs of maintenance are exorbitantly high (\$250,000 in 1988).

Faced with the need to make major capital improvements in these facilities, the National Park Service considered the possibility of moving most administration and maintenance functions to Holbrook and retaining only essential maintenance facilities at the north and south ends of the park. Such a move was rejected because it would result in unacceptably inefficient operations and high annual operating costs (see "Alternatives Considered But Rejected" in part four of this document).

Assuming the entire headquarters complex would have to be either rehabilitated or replaced, the National Park Service contracted with a private architectural and engineering firm to identify the extent of the required structural work at the headquarters complex and to compare the costs of rehabilitation and replacement. That study (Borman/Smith/Bush & Partners 1988) concluded that all the building foundations would have to be replaced, along with many of the walls. The preliminary estimates indicated that rehabilitation costs would be somewhere between 75 percent and 95 percent of the costs of complete reconstruction. The alternative of rehabilitating

the existing structures would result in an initial cost savings of 5 to 25 percent; however, the life cycle costs would likely be lower if the buildings were replaced.

Proposal

Administrative and maintenance facilities at the park headquarters would be replaced inside the park with larger facilities adequate to meet projected staffing and operational needs. If subsequent detailed engineering and cost analyses indicated that existing structures could effectively be incorporated into the new design, they would be salvaged as appropriate. The new headquarters facilities would be constructed on the existing headquarters site, using techniques appropriate for bentonite soils, to avoid additional new land disturbance and the costs of replacing existing utilities.

The ranger station at Giant Logs would be relocated and expanded into buildings currently used for employee housing. Maintenance functions would be relocated to the mesa top behind the Giant Logs area, where they would no longer intrude on a prime resource site.

Housing

Background

Most NPS employees currently live in the park, either at headquarters, where 18 three-bedroom residences and 10 apartments are available, or at Giant Logs, where 6 two-bedroom residences and 2 apartments are available. Current employee housing is substandard. Floors are buckling and walls are severely cracking throughout the headquarters development complex as a result of inadequate construction on bentonite soils. The 1930s units at Giant Logs are cramped and poorly configured for the electrical and other requirements of modern living, and the more recently constructed house has a radon contamination problem. The existing units either have to be extensively renovated or replaced to meet NPS standards. Also, additional housing will be needed to accommodate new

hires (see "Additional Staffing Requirements") and visiting researchers and volunteers. Housing is in a suitable location at the headquarters site; however, the housing at Giant Logs intrudes on a significant resource area and conflicts with visitor use.

The concessioner maintains a residence and 12 trailer sites for its employees at headquarters and a two-unit residence at Giant Logs. The concessioner is committed to improving employee housing as soon as possible, and this work should be coordinated with the NPS employee housing development.

Finding housing on the open market in Holbrook would be an economic hardship on NPS and concession employees. The average price of the sample of 44 two-, three-, and four-bedroom houses on the market in the spring of 1989 was \$57,000. Rental properties are scarce, and the combined expense of housing and commuting 52 miles each day would be economically infeasible for most seasonals who might otherwise want to work for the Park Service or the concessioner. The employees who have purchased homes in the past have found them difficult to sell when they have been transferred.

Proposal

NPS and concessioner employee housing at headquarters would be replaced in generally the same locations with an adequate number of units to accommodate projected staffing levels and approximately ten visiting researchers and volunteers. The existing trailer housing would be replaced with permanent units in compliance with current NPS housing policies.

NPS and concession employee housing would be removed from the Giant Logs area and replaced by the National Park Service and the concessioner at a new, more suitable location in the south end of the park. In its current location the existing housing is intrusive on the natural settings of Giant Logs and Long Logs, which are two of the park's major points of interest. The juxtaposition of visitor facilities and employee housing decreases the aesthetic appeal of the

area for visitors and also infringes on the privacy of employees. The need to periodically expand and improve facilities to adequately meet employees' needs for housing would make this development an even more imposing feature on the landscape in the future if it was not relocated now. A suitable alternative housing site exists on the mesa top behind the Giant Logs area. The

development of this site for employee housing is described under "Development Concepts."

All housing proposals would be reviewed by the regional housing design assistance team and would conform with the requirements of the National Park Service's *Housing Design and Rehabilitation Guideline* (NPS-76).

Development Concepts

Headquarters/Tiponi Point

The new headquarters complex would encompass 10,000 square feet of administrative, community, and post office facilities and 29,000 square feet of maintenance facilities. The existing NPS employee housing would be replaced with 11 three-bedroom residences, 10 two-bedroom residences, and 8 two-bedroom apartments. A ten-bedroom dormitory would be provided for visiting researchers and volunteers. The existing concessioner housing would be replaced with 1 three-bedroom residence, 1 two-bedroom residence, and 8 two-bedroom apartments.

The park road would be realigned in this area to avoid having visitors drive close to the headquarters area and to provide a strong line of sight to the new visitor center (see below). The gas station would be relocated along with the park road, and the entrance station would be relocated just north of the I-40 interchange.

The new 11,000-square-foot visitor center would be sited east of the existing parking pulloff at Tiponi Point. This location would offer the advantage of overlooking an arm of the Painted Desert, where visitors could enjoy scenic vistas, without being visible from the main section of the desert floor. The building would be set back far enough from the rim to avoid a visual intrusion on the wilderness. Light pollution into the wilderness would be avoided by keeping outdoor directional lighting low to the ground and by using blackout curtains in any rooms where nighttime lighting was necessary.

The *Interpretive Prospectus* would be revised, and a new exhibit plan would be proposed to guide interpretive media at the visitor center.

The 8,000-square-foot research center would be adjacent to the visitor center. Some of the work spaces in the research center would have viewing windows, allowing visitors to watch the work in progress there.

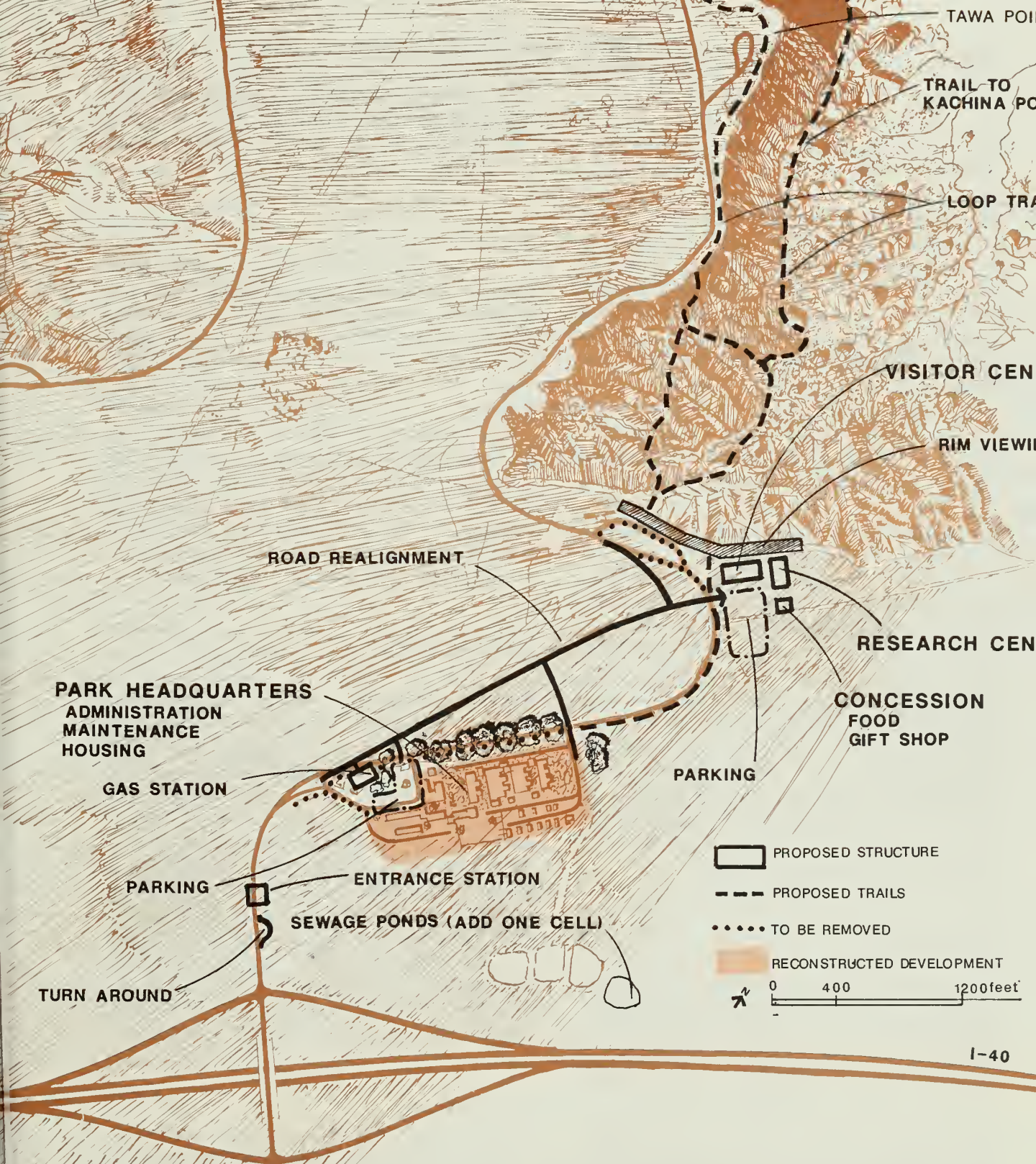
The gift shop and cafeteria would be relocated near the visitor center to keep visitor services consolidated. These facilities would occupy a separate building that would be set back farther from the rim.

The existing overlook at Tiponi Point would be incorporated into a viewing esplanade that would open off the visitor center, leading people directly to the rim. A system of loop trails providing a variety of walking and hiking opportunities would originate at the end of the viewing platform. For people desiring an intermediate walking experience, a new 3-mile loop trail would allow them to hike both above and below the rim between Tiponi Point and Kachina Point. The pinyon/juniper vegetation along the rim would provide a buffer from the road, and this separation would help people start to perceive the desert's tranquility and solitude. Another trail would descend from Tiponi Point to the desert floor, where visitors could either follow a short loop trail before walking back up to the visitor center or walk across the desert floor to the base of Kachina Point, where an existing trail would ascend to the rim. New sections of trail would be carefully sited and designed to avoid any visual intrusions on the wilderness.

The Tiponi Point development would be connected to the existing utilities, water sources, and wastewater treatment facilities serving the headquarters area. A new cell would be added to the existing sewage ponds.

Kachina Point

The Painted Desert Inn National Historic Landmark would be rehabilitated and adaptively used for scenic viewing and interpretation. The two outbuildings would be maintained as part of the historic scene. A state-of-the-art security system would be installed to protect the historic resources from vandalism, theft, and fire.



PROPOSAL HEADQUARTERS/TIPONI POINT

The trailhead and trail to the floor of the Painted Desert would be rehabilitated. New signing would encourage more visitors to use the trail.

Chinde Point

The old quarry site would be recontoured and revegetated to make it a pleasant place for picnicking and viewing the Painted Desert. A 24-table picnic area would be relocated nearer the rim and oriented to take advantage of the views. A short, looped nature trail would be constructed through the revegetated western section of the site.

Tawa, Pintado, Nizhoni, Whipple, and Lacey Points

No further development would be needed at these sites.

Puerco Valley Viewpoint

A new parking pulloff and wayside exhibit interpreting the transcontinental travel corridor and the shortgrass prairie would be provided just north of the point where the main park road crosses I-40. New road signs just north of this pulloff would advise southbound travelers that they were entering the Puerco River valley and advise northbound travelers that they were approaching the Painted Desert.

Puerco Ruins

A new parking lot and comfort station were recently completed at this site. Trails lead from the parking lot to the ruins and to a site overlooking the railroad tracks to the north. New wayside exhibits are being designed for the Puerco ruins trail.

The stone building previously used as the comfort station would be completely refurbished for use as a visitor contact station, which was one of the building's original uses.

Newspaper Rock

This viewpoint would be improved with new optical viewing devices designed for viewing the petroglyphs below the overlook and a new exhibit interpreting the petroglyphs.

Tepees

A new trail between the Tepees and Blue Mesa would start at a trailhead adjacent to the Tepees parking pulloff. The 1.5-mile trail would follow abandoned road and trail alignments, which would be rehabilitated to an unpaved trail standard. The interpretive exhibit now in preparation would be installed to interpret fossil erosion and the field methods of paleontology. It is projected that parking for 20 cars would be needed to adequately serve the proposed new interpretive exhibit and the trailhead. The existing parking pulloff would be expanded to achieve this capacity and redesigned to make it safer.

Blue Mesa

Development of Blue Mesa for day use would involve construction of a picnic area with restrooms in the slight depression on top of the mesa. Water is not available on the mesa, so composting toilets would be installed. The location of the picnic area would keep it out of view from the foot of the mesa. A trail from the picnic area would connect with the trail leading to the floor of the badlands. Four to six single tables and two groups of two tables would be provided. All the tables would be covered and screened from the wind. A new 10-car parking lot would be constructed to serve the picnic area. The separate trailhead parking area would be retained at its existing capacity of 9 cars.

Agate Bridge

This significantly modified resource would be deemphasized in the park literature, and a new wayside exhibit contrasting historic and modern management practices would be installed. The existing parking lot and comfort station would be

retained. A 1/8-mile barrier-free loop trail would be constructed from the parking lot to the bridge and the mesa rim overlook. This trail would channel visitor foot traffic and help protect the rare gladiator milk vetch from trampling.

Jasper Forest

The existing parking pulloff would be retained. The new wayside exhibit now in preparation would be the only additional development at this area.

Crystal Forest

The existing parking lot would be retained. The new wayside exhibit would be the only new development at this site.

The Flattops

The existing parking pulloff, trailhead, and trail would be removed and the development sites would be revegetated.

Giant Logs/Long Logs

All park housing and maintenance facilities at Giant Logs would be relocated to the nearby mesa top about 1.5 miles northwest of the existing development. The new site is out of view from Giant Logs and Long Logs and has no wood or other fossil remains. The shortgrass prairie at this site has previously been disturbed by the construction and use of corrals, a water reservoir, and an abandoned section of old US 180. The site is served by an existing road (the old US 180 alignment) and has utilities nearby. The road would be upgraded as part of the new development.

NPS housing requirements at the new site would include 2 three-bedroom and 2 two-bedroom residences and 9 apartments. The concessioner would need 2 two-bedroom residences at the mesa-top administrative site. One residence would be retained at Giant Logs to provide a

ranger presence and emergency response capability.

The abandoned residences at Giant Logs would be adaptively used for administrative offices and visitor facilities. The ranger station would be relocated to the building on the east side of the existing residential complex, which is an area of about 2,200 square feet. Some of the remaining residential structures would be renovated to provide a small snack bar, a small gift shop, and restrooms. The sewer system would be improved to adequately support these uses. The newest residence, which is not an integral part of the historic building complex, would be removed. It is likely that some additional space would still be available in the north or west buildings for some administrative functions if the east building proved inadequate to house them all.

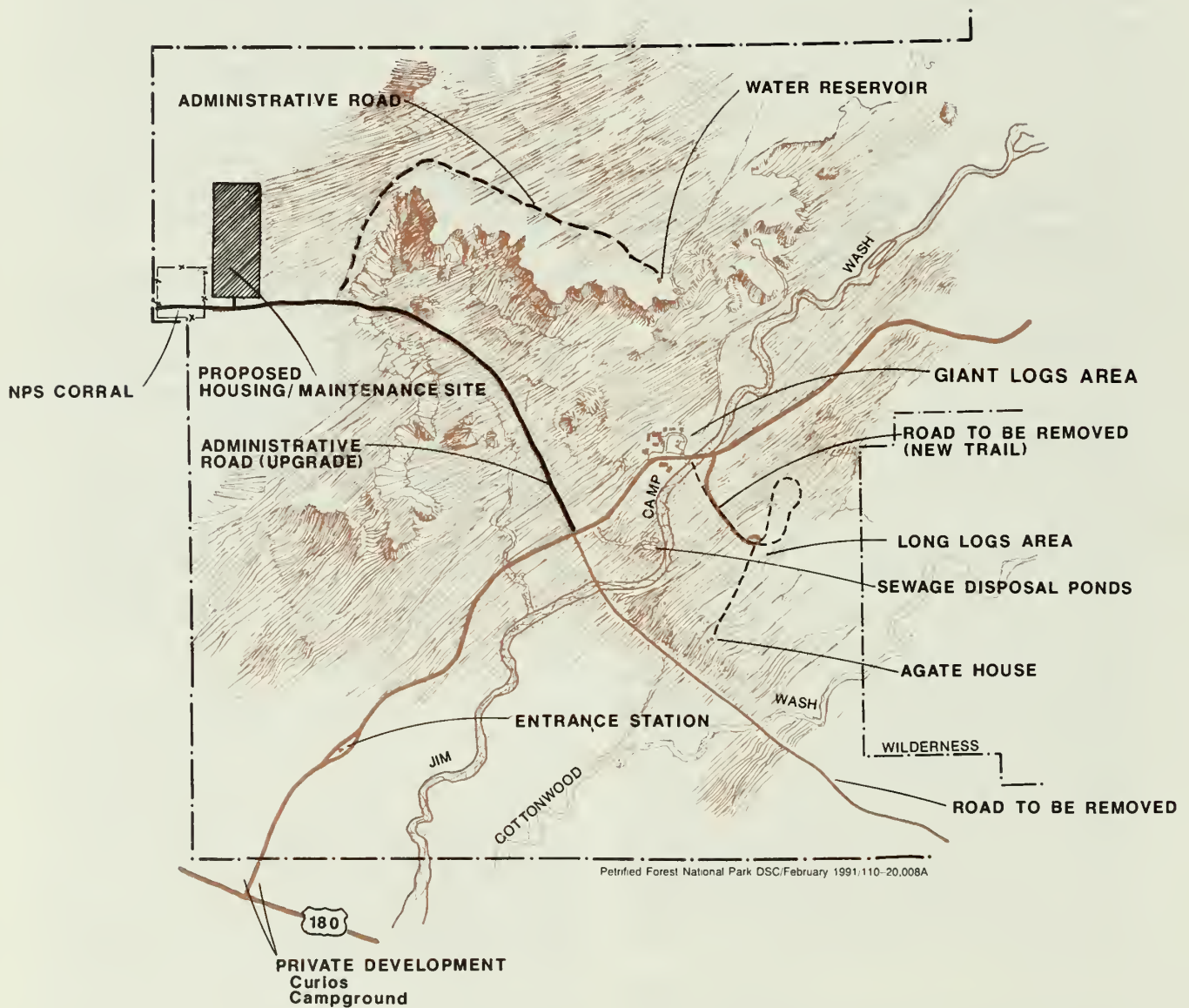
The buildings would be returned to approximately their 1930s appearance by removing the more modern room additions, replacing the windows with the historic casement type, removing roofline intrusions, such as swamp coolers, removing the chain link fencing, and refurbishing the central courtyard and rebuilding the ramadas using historically appropriate materials. The courtyard would be landscaped as a large shaded outdoor seating area for visitors. The picnic area would be retained at its existing location, providing additional outdoor eating space, and the ramadas there would be redesigned to be compatible with the ramadas in the courtyard.

The visitor center/ranger station would be renovated for exclusive use as the new visitor center. Trails would lead from the center to both the Giant Logs and the Long Logs interpretive areas. The existing parking lot at Long Logs would be removed, and the area would be managed as a quieter, more secluded walk-in site available to visitors with the time and inclination to travel away from the road corridor.

Replacements for the existing maintenance facilities and a new structure to house the fire engine would be constructed on the mesa top, along with the new park housing, and the existing maintenance buildings would be removed. The new firehouse would be close enough to Giant

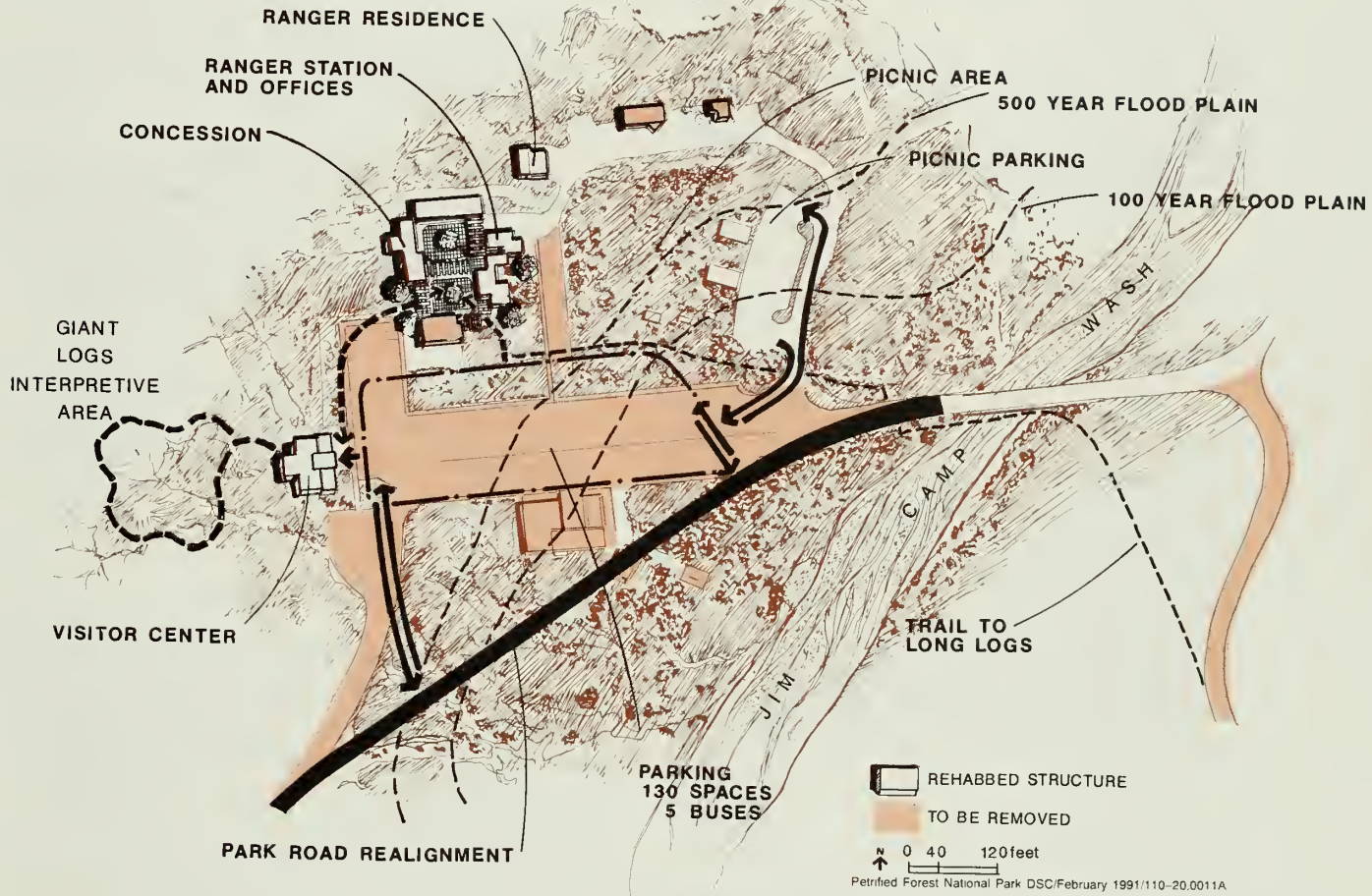
PROPOSAL

SOUTH ENTRANCE AREA



PROPOSAL

GIANT LOGS/LONG LOGS



Logs to provide timely response to structural fires at that site as well.

The existing concession building and concessioner residence would be removed. The access and parking situation would be improved by realigning the road to run south of the parking lot and by redesigning the parking lot configuration.

The sewage lagoons serving the visitor center and other facilities at Giant Logs would be floodproofed by extending the existing riprap to adequately protect the site.

Parkwide Utilities

Water Supply

The park currently has a single water source: well number two, on the north bank of the Puerco River west of the main park road. The quantity of water from this well is sufficient to meet current and projected levels of demand. However, the quality is very poor, and the park needs a backup water source. The park plans to enter into a contract with the Navajo Tribal Utility Authority to purchase water with better quality than what is currently available inside the park. The existing park well would be retained as a backup water source.

Power Lines

All power and telephone lines in the park would be buried, and all unused lines would be removed, to eliminate these intrusions on the natural scenery.

Design Character Guidelines

The design character of all facilities, including waysides, parking lots, picnic areas, and trails, would be consistent throughout the park. The recommended guidelines are as follows:

New and renovated structures should incorporate traditional southwestern design

elements and materials, such as cut sandstone, adobe, vigas, and flat roofs.

The use of gray cut sandstone for retaining walls should be consistent. Such walls are already fairly uniform throughout the park, and they blend well with the natural landscape.

The preferred surfacing for walkways is exposed aggregate because it blends better with the natural landscape.

The obtrusive round river cobbles that have been used in some places to prevent erosion and define the limits of paths should be removed and replaced with native rock from the region that matches the natural rock in the area.

Ramadas in the picnic areas and near the visitor center should be built in the southwestern tradition using unhewn logs and poles.

Access for Disabled Visitors

Sensitive park design will be employed to allow disabled visitors to enjoy the park and to participate in recreational activities using the same facilities and programs as the able-bodied. Similar consideration will be given to employee work areas and housing. The degree of accessibility will be proportional to the degree of development. Visitor facilities and employee work areas and housing in developed areas will be built or rehabilitated to make them fully accessible. Most of the existing facilities currently meet this standard. New facilities at Tiponi Point and Giant Logs will be designed and constructed or rehabilitated to make them fully accessible. Facilities in backcountry areas, which typically have little development, will be made accessible only to the extent feasible without major modification of the site. Thus, trails to and within backcountry areas will remain basically unimproved, with no change in the existing topographic variations. Where possible, accessibility considerations will be developed in

consultation with local clubs and organizations whose members are disabled.

Phasing Schedule and Development Costs

The phasing schedule for the proposal would be as follows.

Phase 1:

Construct visitor facilities and research center at Tiponi Point

visitor center	\$ 4,421,000
interpretive media	327,000
research center	3,075,000
trails	191,000
utilities	516,000
roads	845,000
road removal/restoration	198,000
parking	<u>420,000</u>
subtotal	\$ 9,993,000

Phase 2:

Develop new housing/maintenance complex on mesa top northwest of Giant Logs

employee housing	\$11,423,000
maintenance facilities	1,056,000
utility lines	<u>1,102,000</u>
subtotal	\$13,581,000

Phase 3:

Replace/expand headquarters facilities

administrative offices	\$ 2,594,000
maintenance facilities	6,410,000
employee housing	3,720,000
employee/community bldg.	<u>615,000</u>
subtotal	\$ 13,339,000

Phase 4:

Adapt 1930s structures at Giant Logs for visitor center, ranger station, and concession

visitor center	\$ 403,000
interpretive media	236,000
plaza/ramada	92,000
restrooms	229,000
snack bar	73,000
gift shop	91,000
ranger station	409,000
picnic area	19,000
trails	88,000
trail bridge	131,000
land restoration	144,000
old US 180 removal	587,000
roads	266,000
parking	343,000
road/parking removal	<u>169,000</u>
subtotal	\$ 3,280,000

Phase 5:

Rehabilitate Painted Desert Inn, improve visitor facilities along the park road corridor

Painted Desert Inn	\$ 2,306,000
interpretive media	170,000
picnic areas	135,000
trails	79,000
restrooms	288,000
parking	<u>62,000</u>
subtotal	\$ <u>3,040,000</u>

Total, All Phases

\$43,233,000

Annual Operating Costs of Proposed Development

The following estimates are based on the costs of operating existing similar facilities with comparable square footages.

Headquarters

Administration building	\$ 28,000
Maintenance building	13,000
Housing	42,000

Tiponi Point

Visitor center	19,000
Research center	17,000

Kachina Point

Painted Desert Inn	15,000
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Chinde Point

Comfort station	400
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Blue Mesa

Comfort station	400
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Puerco Ruins

Contact station	100
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Giant Logs

Visitor center	6,000
Ranger station	7,000
Maintenance facility	2,000
Fire house	300
Ramada	100

Long Logs

Ramada	100
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Parkwide

Picnic areas	2,000
Trails	19,000
Parking lots	16,000
Pullouts	2,000
Roads	55,000
Water (purchase)	<u>37,000</u>

Total	\$281,400
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Boundary

Background

Globally and nationally significant paleontological, archeological, and scenic resources directly related to the resource values of Petrified Forest National Park are not included within the current park boundary. Although the boundary has been adjusted on several occasions, the focus in the past has been on the concentrations of petrified wood, particularly the large logs, which are both highly visible and highly vulnerable to theft.

Recent scientific work has now revealed that petrified wood is only one part of a globally significant record of complete Triassic period ecosystems contained within the Chinle escarpment. The "mineralized remains of the Mesozoic forest" that the park was established to protect are now known to include leaf imprints, pollens, petrified wood, the earliest known sample of amber, and even nonmineralized tissues of more than 140 plants (most of which were herbaceous, not woody), along with fossilized remains of more than 50 animals, including both vertebrates and invertebrates, such as freshwater clams. These resources, which together constitute the best record of Triassic period ecosystems found anywhere in the world, are embedded throughout the Chinle escarpment, which trends in an east-west direction and crosses the park in the area of Blue Mesa and Jasper Forest (see the Proposed Boundary Changes map). Only 6 miles, or about 25-30 percent, of this 22-mile long escarpment is currently included inside the park. Furthermore, the exposures within the park have been eroded by Dry Creek, which has cut through the escarpment, isolating the east end of the Jasper Mesas and Blue Mesa as remnants of the continuous escarpment. Because they have been accessible for research, the outcrops in the park have been serving as the standard reference for evaluating all late Triassic sites throughout the world; however, the research and interpretive values of the more continuous east and west portions of the Chinle escarpment that are now outside the park are believed to surpass those of the portion inside the park. Statements of the

area's value by paleontologists and geologists at Northern Arizona University, the University of California at Berkeley, and the New Mexico Museum of Natural History are included in appendix C.

In addition to these paleontological resources, hundreds of important archeological sites related to several prehistoric cultures exist outside but adjacent to the park boundaries. Puerco Ridge and the Dead Wash and Puerco River drainages hold especially great potential for significant archeological resources. Isolated artifacts perhaps 10,000 years old and mammoth bone have been found, separately, in this region. Rare Paleo-Indian sites are intermixed with Basketmaker villages, Pueblo period religious and community centers containing great kivas and other monumental architecture, some of the best and most unusual rock art panels in the Southwest, petrified wood quarries, and Navajo sites. Many of these sites appear to have significance equal to or greater than the sites known to exist inside the current park boundary. Research at these sites promises to increase understanding of the trade networks that supported the flow of goods, people, and ideas throughout this frontier region in late prehistoric times and to help fill the current gap in the chronology between the prehistoric and historic periods. Most of these sites are in areas that also have significant paleontological resources.

Adjacent lands rich in paleontological and archeological sites are also important visual resources. The park is perceived by the average visitor as being much larger than it actually is. The boundaries have been established along section lines, and they cut across many large landscape features. Major viewpoints in the park, such as the overlooks along the Painted Desert rim and at Blue Mesa and Jasper Forest, look out over landscapes that are partially inside and partially outside the park. In areas where the landscape remains in a relatively natural state, visitors perceive the park as continuing to the horizon. This illusion is not detrimental to the visitor experience, but it causes a false

impression that what is viewed is preserved inside the park. In fact, the opposite is true. The scenic vistas so enjoyed by park visitors do not necessarily exist as a result of park management preserving the scene, but rather as a result of a lack of development action by a park neighbor.

Most of the lands adjacent to the park have been managed as part of large cattle ranches for the past 120 years. However, this land use pattern is starting to change. New land uses occurring within the past 30 or 40 years include mineral exploration and mining—including large-scale, mechanized petrified wood mining on private lands (with no reclamation efforts)—and subdivision of square-mile sections into 40-acre ranchettes. None of these new land uses is compatible with the long-term preservation of paleontological or archeological resources. These resources are also seriously threatened by illegal activities occurring in the region, such as theft of petrified wood from public lands, pot hunting, and vandalism to petroglyph sites.

Potential future land uses include a very large landfill for disposal of solid waste coming from the East Coast. This use has been proposed for a site in the headwaters of Ninemile Wash, about 8 miles east of Blue Mesa. The landfill would initially be one square mile in size but could be expanded to 20 square miles, making it the largest landfill in the world. This proposal has raised concerns about the destruction of paleontological and archeological resources and also about the maintenance of air quality and water quality in the park. The landfill would be a major source of fugitive dust and possibly of other pollutants associated with emissions from incineration and contamination of surface or groundwater sources. It would also introduce alien species of plants and animals into the shortgrass prairie ecosystem. Viewsheds east of the park would be seriously compromised, especially from major viewpoints like Blue Mesa and Agate Bridge.

An excellent opportunity may now exist for including adjacent areas of significant resources inside the park boundary. Major landowners in the area, including the Bureau of Land Management, state of Arizona, and several

private landowners, are planning to consolidate their holdings, realign jurisdictions, and dispose of certain lands adjacent to the park. Most of the BLM lands adjacent to the park have been identified for disposal (*Federal Register*, August 25 and October 20, 1989, and July 3, 1990).

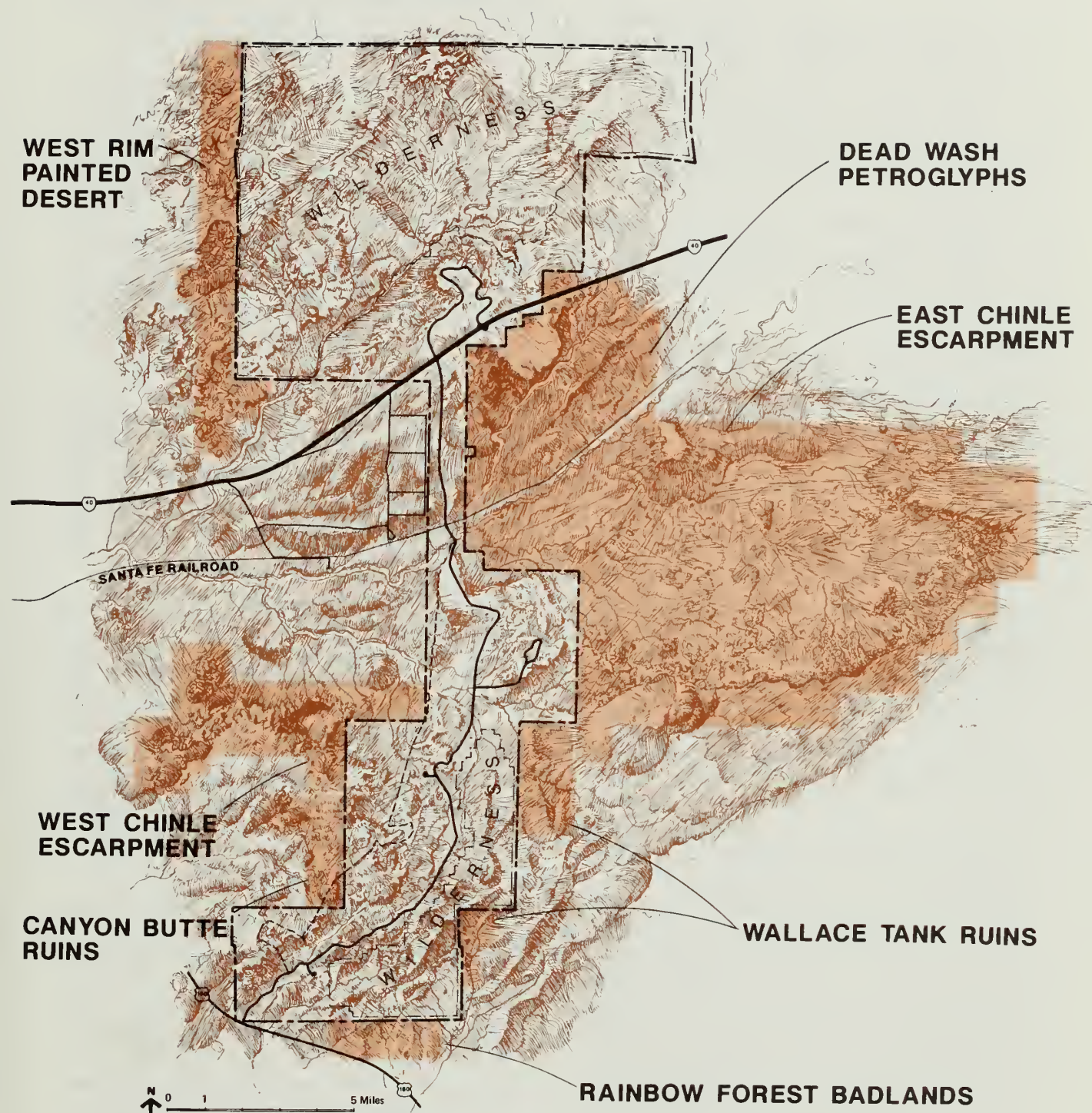
Discussions of the significant resources in and around the park and the management strategies that might be used to preserve them have thus far involved the following groups and agencies:

Apache County Commissioner
Arizona Office of Tourism, Acting Director
Arizona State Land Department,
Commissioner and staff
Bureau of Land Management, Deputy State
Director and staff
Congressman Jon Kyl's staff district
representative
Holbrook City Mayor and staff
National Park Trust
National Parks and Conservation Association,
Arizona/New Mexico Parks and
Conservation Council
Navajo-Hopi Relocation Commission
Sierra Club, Arizona Director
Trust for Public Lands, Vice President and
staff

These landowners and representatives of the environmental community in Arizona have expressed agreement that the National Park Service should pursue a boundary expansion based on the long-term protection of globally significant paleontological resources and potentially nationally significant archeological resources, some noting additionally that such a boundary expansion would also protect scenic viewsheds, air quality, wilderness values, and a larger representative sample of the shortgrass prairie ecosystem.

Proposed Boundary Changes

The National Park Service proposes that Congress consider a boundary expansion at Petrified Forest National Park to protect globally and/or nationally significant resources and park values from existing and proposed uses that



PROPOSED BOUNDARY CHANGES

threaten to diminish or destroy them. The critical resources to be protected are

globally significant paleontological deposits in the Chinle formation, which extends eastward from the park boundary to the vicinity of Ninemile Seep, westward to the northwestern rim of the Painted Desert and to the Twin Buttes area, and southward to the southernmost edge of the Long Logs area

potentially nationally significant archeological sites, including the petroglyphs and ruins in Dead Wash and the Wallace tank and Canyon Butte ruins

Inclusion inside the park boundary is considered the only feasible means of protecting significant paleontological and archeological resources over the long term as land uses change in the region. The other public landowners in the region (the state of Arizona and the Bureau of Land Management) recognize the significance of the paleontological resources on their lands and have expressed an interest in seeing them preserved. The Arizona State Land Department has closed approximately 33,800 acres adjacent to Petrified Forest National Park to both surface and subsurface applications to facilitate NPS resource studies. However, the public trust mandate for the state lands and the multiple use mandate for the BLM lands would not be served by the long-term noneconomic preservation management of this area.

If they were included in the park boundary these areas would be managed primarily for paleontological and archeological resource preservation, research, and interpretation according to National Park Service policies. These policies generally preclude any consumptive uses of resources unless specifically authorized by Congress. Consequently, unless Congress specifically directed otherwise, existing private land uses, including livestock grazing, would be phased out inside the park boundary. All of the proposed park additions would be administratively feasible to manage. Additional park staff would be required for law enforcement, interpretation, and maintenance. The exact number would be

determined by the extent of expanded programs for paleontological and archeological resource preservation, research, and interpretation. The additions would be studied for suitability and feasibility for addition to wilderness.

The parcels containing significant resources important to the park are described below in order of their priority for possible addition to the park. The proposed boundary lines were mostly drawn to include entire sections, since the existing ownerships follow section lines. Consideration was also given to creating an administratively feasible boundary that could be reasonably identified, fenced, and protected. The parcels identified for inclusion in the park are currently owned by the federal government (Bureau of Land Management), the state of Arizona, and approximately eight individuals and land companies. Together they total approximately 97,800 acres. More detailed information about the ownership, size, and resource significance of these parcels is presented under "Proposed Additions" in part three of this document.

If the boundary was expanded by Congress, a land protection plan would be prepared to determine whether the lands and resources would most appropriately be managed through cooperative agreements with the existing owners or through fee or less-than-fee acquisition. Prior to any acquisition the parcels would be surveyed for contaminants and abandoned mine hazards. The ownership of subsurface mineral rights would also be determined prior to acquisition.

Priority One: Paleontological Resource Areas

The Chinle Escarpment. The Chinle escarpment cuts across the park from west to east. On the west it extends beyond the park boundary into the Twin Buttes, Ramsey Slide, and west Jasper Mesas area, and on the east it extends for 11 miles, ending 2 miles east of Ninemile Seep near the boundary of the Navajo Reservation. The proposed boundary change would include a 10,400-acre parcel on the west and a 56,480-acre parcel on the east. Together these two parcels would expand the size of the existing

park by more than 70 percent. This large expansion would be warranted by the significance of the Chinle escarpment. From a global perspective, the park that would be created by these proposed additions would still be a relatively small place in which to preserve the planet's best record of the late Triassic period.

Sedimentologists, geologists, and paleontologists who have visited these areas agree that the more continuous geologic exposures and fossil bone-bearing strata in these parcels are superior to those now protected in the park. Research in these areas promises to increase understanding of Triassic flora and fauna and to allow for the academic reconstruction of the drainage networks that existed here during the late Triassic period, leading to a better understanding of changing climatic and tectonic conditions (see supporting documentation in appendix C).

These parcels would be managed primarily to promote paleontological and archeological resource protection, research, and interpretation. Surveys would be conducted to identify potentially significant sites, and a research plan would be prepared to guide the systematic study of the resources.

Significant paleontological sites would be excavated under the direction of an approved research plan. Temporary road and air access would be provided where necessary to support the excavation and transport of large fossil remains found in remote areas of the park. Provisions would also be made to provide access for visitors to active research sites. No trails would be built because sites in these areas would be easily accessible by cross-country travel.

Securing these parcels for the study and protection of paleontological resources would have the added benefits of protecting archeological and scenic resources, since these areas also contain hundreds of archeological sites and would secure the scenic viewsheds for major vistas from Blue Mesa, Agate Bridge, Jasper Mesas, and the Puerco ruins.

The southern boundary of the large east parcel was drawn to protect the viewshed to the horizon along the escarpment edge and to include all of the two major drainages within the parcel (Ninemile Wash and Saddle Horse Draw). Ninemile Wash is a critical water resource for the park. It has its confluence with the Puerco River less than ½ mile above the park's only well, and the National Park Service has a continuing concern about how the wash might affect the quality and quantity of water in the well's shallow alluvial aquifer. From the eastern edge of the Chinle escarpment abutting the Navajo Reservation, the proposed boundary would turn north and cross over into the headwaters of Saddle Horse Draw, then follow the Puerco River/Santa Fe Railroad down to the existing park boundary. This parcel would be contiguous to the Dead Wash petroglyphs parcel northwest of the railroad. That parcel is primarily an archeological resource area and is described under priority two.

The Santa Fe Railroad radio-repeater facility, which the National Park Service uses through an agreement, would be included inside the park boundary. A new use agreement would be negotiated with the railroad and with the Fitzgerald Ranch regarding operation of and access to this facility.

West Rim of the Painted Desert. When the Painted Desert was added to Petrified Forest National Monument in 1932, the section-line boundary bisected the Devils Playground, which is a fossil-rich outcrop of the Chinle, and cut off the west rim of the Painted Desert. The proposed boundary change in this area would extend the boundary 1 mile to the west, taking in a 7,920-acre parcel, to protect the remainder of this important paleontological resource and the scenic integrity of the panoramic views across the Painted Desert from viewpoints along the main park road. Improvements on subdivisions just south of this parcel near I-40 are already beginning to intrude on these views. The addition of this parcel would also protect the headwaters of Wildhorse Wash and several other badland drainages that originate on the rim and flow into the park.

This parcel would be managed primarily for paleontological and archeological resource protection, research, and interpretation, the same as the other parcels except that no road access would be allowed on the face of the escarpment because of concerns over visual intrusions on the adjacent Painted Desert wilderness. The southern end of this parcel provides the first view of the Painted Desert visitors see when approaching the park from the west on I-40. Protection of this scenic view is important.

Rainbow Forest Badlands. This 1,920-acre parcel takes in the southernmost extension of the fossil-bearing strata continuing south from Long Logs. Fossil bone has been found nearby on park land. The addition of this parcel would also protect range utilized by the park's pronghorn herd.

The parcel would be managed primarily for paleontological research. The abandoned section of old US 180 (1.4 miles) would be removed and the corridor would be revegetated, the same as proposed for the abandoned portions of US 180 currently inside the park boundary. The present alignment of US 180, which cuts across the southwest corner of section 18, would in effect become the south boundary of the park in this area.

Priority Two: Archeological Resource Areas

Dead Wash Petroglyphs. Dead Wash is significant for many archeological sites. The proposed boundary change would add a 14,680-acre parcel including extensive multi-paneled petroglyphs and a series of visually linked pueblo sites that appear to have been associated with frontier communications and trade within the sphere of Chacoan influence. Addition to the park would ensure the long-term preservation of these significant resources. Inclusion of this parcel would also add more of the historic Puerco valley transportation corridor and extensive shortgrass prairie to the park.

This parcel would be managed primarily for archeological resource protection, research, and

interpretation. No trails would be built because it would be easy for people to travel cross-country.

Wallace Tank Ruin. The Wallace tank ruin (also known as the stone axe ruin) lies less than a mile east of the boundary in the vicinity of Crystal Forest. It is larger than the nationally significant Puerco ruins and was occupied somewhat later, suggesting that it may have played an important role in the closing phases of the area's prehistory and may help close the gap in the chronology between the prehistoric and historic periods. The proposed boundary change would include a 3,840-acre parcel encompassing the ruin and also some paleontological resources and shortgrass prairie utilized by the park's pronghorn herd.

This parcel would be managed primarily for archeological resource protection, research, and interpretation.

Canyon Butte Ruin. This 2,560-acre parcel is proposed for acquisition based on its high potential to yield information about the human history of the park area. Known archeological sites include the Canyon Butte ruin, a late Anasazi site showing evidence of warfare that can help close the gap in the chronology between the prehistoric and historic periods. Canyon Butte is one of 15 buttes that step across the prairie starting with the Flattops and ending about 5 miles to the northwest. The boundary adjustment was drawn to include this distinctive landscape unit, which is the major view seen by visitors looking west as they travel along the park road between Long Logs and the Flattops. The view of these mesas from the Jasper Forest overlook is also important. The park's pronghorn herd utilizes this area. The southern boundary of this parcel was drawn to include the portion of the park's water line now outside the boundary.

This parcel would be managed primarily for archeological research.

Recommended Studies

The following studies would be conducted on new lands included within the park boundary:

- paleontological and archeological overview
and assessment
- wilderness suitability study
- land protection plan
- determinations of subsurface mineral rights
- contaminants survey
- abandoned mine hazard survey

Part Three: Affected Environment



The Park

A general overview of the park environment is provided in part one of this document. Additional information about natural and cultural resources is included in the resource management sections in part two. Still more detailed descriptions pertinent to the impact analyses are provided below.

Major Habitat Types

Shortgrass prairie covers approximately 42,240 acres in the park, primarily in the Puerco River valley and south. Since cattle grazing was excluded from the park in 1962, the prairie has recovered from overgrazing on the relatively stable slopes, and the vegetative cover in those areas is noticeably denser than on the grazed lands just outside the park boundary. The recovering prairie vegetation is characterized by alkali sacaton, blue grama, galleta grass, Jones saltbush, four-wing saltbush, golden buckwheat, and Mormon tea. Where soil conditions are different, the grasses give way to a mixed desert shrubland.

The desert shrub association, characterized by Bigelow's sagebrush, golden buckwheat, Drummond's goldenbush, Green's rabbitbrush, rubber rabbitbrush, and greasewood, occupies approximately 14,080 acres in the park, mostly in the Puerco River and Rainbow Forest units.

A juniper woodland, characterized by two-leaf pinyon, one-seed juniper, golden buckwheat, and Mormon tea, exists immediately adjacent to and below the Painted Desert rim and on Chinde Mesa and Pilot Rock. This is a minor association in the park, covering only about 1,280 acres of parkland.

Wildlife is concentrated in the shortgrass prairie ecosystem. Gunnison's prairie dogs are common in the grasslands north of the river, and several of their towns are visible from the park road. Pronghorn, black-tailed jackrabbits, desert cottontails, and coyotes are also common. Many bird species, such as flycatchers, warblers, and

sparrows, migrate through the park in spring and fall, relying on the insects and seeds in the shortgrass prairie and mixed desert shrubland to sustain them on their way. Common reptiles include collared lizards, sagebrush lizards, Painted Desert whiptail lizards, and Hopi rattlesnakes. A limited riparian zone along the banks of the Puerco River is dominated by tamarisk, an alien species that is rarely usable by native wildlife. Some planted cottonwoods have survived, and they provide valuable habitat, especially for migrating birds.

Species of Special Concern

No federally listed threatened or endangered wildlife reside in the park, although American peregrine falcons (*Falco peregrinus anatum*) and southern bald eagles (*Haliaeetus leucocephalus leucocephalus*) occasionally pass through on their seasonal migrations. The black-footed ferret (*Mustela nigripes*), listed as endangered on both federal and state lists, possibly existed within the Petrified Forest area at one time but has now been extirpated throughout the state.

Two known rare plants inhabit the park. Gladiator milk vetch (*Astragalus xiphoides*), a category 1 candidate for threatened status on the federal list of threatened and endangered plants (USFWS 1989), occurs in 15 populations in the park extending from Chinde Mesa southward through Lithodendron Wash to Blue Mesa, Agate Bridge, and Crystal Forest. An inventory of these populations conducted in 1988 and 1989 estimated that they contained a total of about 5,000 individuals. Paper-spined cactus (*Pediocactus papyracanthus*), a category 2 candidate, occurs in fine sandy clay loam soils on open flats between 5,000 and 7,200 feet in the pinyon-juniper woodlands of Navajo County and eastward into New Mexico. Two localities are known within the park, both in the Rainbow Forest area, well away from any present or proposed development. No rare plant population surveys have been completed for this species.

See appendix B for references to consultation with the U.S. Fish and Wildlife Service.

Cultural Resources

The archeological sites that are near existing or proposed development sites are listed in table 3. Historic resources are described below.

The Painted Desert Inn, a former trading post and inn on the rim of the Painted Desert, has been designated a national historic landmark in recognition of its historic and aesthetic qualities. It also has regional significance as a product and symbol of New Deal work relief programs. Originally constructed in 1924, the stone structure was gutted and rebuilt between 1937 and 1940 by the Civilian Conservation Corps using local materials, including some petrified wood. The resulting Pueblo Revival structure is two stories high, but banked into a hillside, so it exposes a low profile to the Painted Desert. The thick stone walls are covered with pink-earth-toned stucco. The magnificent interior spaces are finished with log vigas, carved posts, flagstone floors, and wood-frame casement windows. The building's masterful combination of architecture and design is enhanced by a painted glass skylight designed by Lyle Bennet in 1937 and murals by Hopi artist Fred Kabotie painted in 1947. The 28 rooms were originally used for public information, restrooms, park offices, lunch and dining rooms, a soda fountain, a bar, a trading post, and six sleeping rooms. Over time, the inn has become badly deteriorated, and it is now closed to the public. Work is underway to preserve this significant cultural resource. Two outbuildings associated with the inn are currently used for storage.

A portion of old Route 66 is still visible in the park. The abandoned road segment and other features of the corridor will be included in a study authorized by Congress to determine the significance and opportunities for preservation of this famous highway. Once extending for 2,000 miles from Chicago to Santa Monica, Route 66 played a significant role in the westward migration of Americans fleeing the Dust Bowl, the boom in tourist travel following World War II, and

other aspects of 20th century American history. The segment of Route 66 through Arizona is an early example of the roads built under the 1926 National Highway Program.

The buildings in the Giant Logs development complex were evaluated for eligibility for listing on the National Register of Historic Places and found by the Arizona state historic preservation officer to be ineligible because their integrity of design, materials, and workmanship has been diminished by significant exterior and interior modifications. The concession building, which is the oldest structure on the site, has been drastically altered and no longer resembles the other structures. Architecturally incompatible modifications, including room additions, changes in interior layout, and the addition of a plethora of pipes, fences, antennas, solar panels, and other amenities of modern living, have also been made to several of the residences and to the rear of the visitor center/ranger station building. In finding the buildings ineligible, however, the state historic preservation officer concluded that the alterations causing the ineligibility of buildings 51 and 52 (the west/north and east buildings surrounding the courtyard in the housing complex) could be reversed, and recommended a number of actions to bring the structures back into an eligible status. The buildings were evaluated in some detail by an NPS historical architect, who concurred that the structures could be rehabilitated to return them to their 1930s appearance.

Site and Facility Analyses

Headquarters/Tiponi Point

The headquarters development site and the proposed development site near Tiponi Point both lie in the mixed desert shrub ecosystem. Gunnison's prairie dogs, black-tailed jackrabbits, desert cottontails, and coyotes inhabit the area, and migratory shorebirds and waterfowl stop over at the sewage treatment ponds. No federally listed threatened or endangered species occur in the area under consideration for development.

**TABLE 3: ARCHEOLOGICAL SITES
NEAR EXISTING OR PROPOSED DEVELOPMENT**

Headquarters Area

Prehistoric sherd and lithic scatters and possibly buried structures. Site integrity and national register qualifications undetermined.

Tiponi Point Vicinity

Sherd and lithic scatters and possibly buried structures dating from Pueblo II and III periods. Site integrity and national register qualifications undetermined.

Kachina Point Vicinity

Sherd and lithic scatters and possibly buried structures dating from Pueblo II and III periods. Site integrity and national register qualifications undetermined.

Historic artifact scatters dating from the early 1900s. Site integrity and national register qualifications undetermined.

Painted Desert Rim

Isolated artifacts and prehistoric sites (lithic scatters, hearths, quarries, and rock alignments). Site integrity and national register qualifications undetermined.

Painted Desert

Historic litter of broken bottles across the Painted Desert. Location, site integrity, and national register qualifications undetermined.

Painted Desert Petroglyphs and Ruins Archeological District. Listed on the National Register of Historic Places.

Puerco River Vicinity

Prehistoric/historic transportation corridor (possible prehistoric travel route, Whipple's 35th Parallel route, Beale camel trail, traces of 1800s wagon/stage road, traces of Route 66, Santa Fe Railroad tracks). The 35th Parallel route and wagon/stage road are listed on the National Register of Historic Places. Site integrity and national register qualifications of other resources undetermined.

Puerco ruins (75-room masonry pueblo) and petroglyphs, including a solar calendar, from the Pueblo IV period. Listed on the National Register of Historic Places and List of Classified Structures.

Ruins of CCC camp. Site integrity and national register qualifications undetermined.

Newspaper Rock

Newspaper Rock Petroglyphs Archeological District. Listed on the National Register of Historic Places.

Blue Mesa Vicinity

Prehistoric rock art, artifact scatters, and possibly buried structures from the Pueblo II and III periods. Site integrity and national register qualifications undetermined.

Remains of early 20th century camps and excavations related to paleontological research. Site integrity and national register qualifications undetermined.

Agate Bridge Vicinity

Historic sandstone foundations and remains of superintendent's house and shed, trash deposits. Site integrity and national register qualifications undetermined.

Flattops Area

Prehistoric pit house village site from the Basketmaker period, showing evidence of horticulture and early ceramics. Listed on the National Register of Historic Places.

Early Navajo site (only documented Navajo site in the park). Listed on the List of Classified Structures. Site integrity and national register qualifications undetermined.

Giant Logs/Long Logs Vicinity

Traces of CCC camp, golf course, and early park structures dating from the 1930s. Site integrity and national register qualifications undetermined.

Agate House (bldg. 6), a prehistoric structure built of petrified wood and reconstructed in the 1930s. Listed on the National Register of Historic Places and List of Classified Structures.

Prehistoric surface structures, petrified wood masonry, and quarry areas from the Pueblo I, II, and III periods. Site integrity and national register qualifications undetermined.

Twin Buttes Archeological District, encompassing early Anasazi pit house village with good research potential. Listed on the National Register of Historic Places.

Soils in the headquarters area, and in many locations throughout the park, are bentonite clay, which has a great capacity for expansion when wet and contraction when dry. When nonflexible structures are placed on these soils, as occurred at the headquarters site, they heave and crack as the soils move beneath them. There is also evidence of some subsidence of the unconsolidated rock beneath the soils further contributing to the instability of the headquarters complex.

A prehistoric archeological site exists in the general vicinity of the headquarters.

Existing facilities at the headquarters site include

- a two-story visitor center/administration building
- a gift shop and 140-seat cafeteria
- a gas station
- an entrance station
- a community building
- a post office
- a two-story, eight-unit apartment building
- 18 three-bedroom residences
- a manager's residence and trailer park housing concession employees
- a maintenance building and six vehicle storage bays
- a horse barn

This complex was built in the 1960s and has a modern architectural style. The structures are steel frame with brick masonry.

Painted Desert Rim

The Painted Desert Rim is developed with a rim drive and eight pulloffs. All of these developments are on the edge of the juniper woodland community. The first pulloff, Tiponi Point, has parking, an interpretive viewpoint, and a trail to the floor of the Painted Desert. Prehistoric archeological sites exist near this pulloff and along the proposed trails between Tiponi Point and Chinde Point.

Kachina Point is the site of the Painted Desert Inn. Other development at Kachina Point

includes a parking pulloff, a viewpoint, and a trail to the floor of the Painted Desert. The trail at this viewpoint is the major access to the Painted Desert wilderness. Prehistoric archeological sites dating from the Pueblo II and III periods exist in the vicinity of Kachina Point.

The next point, Chinde Point, is an extensive ledge that was created by borrow operations in the 1960s. All of the natural grassland and juniper woodland vegetation was destroyed at the quarry site, but most of the site has naturally revegetated with desert shrubs over the past 25 years. A small picnic area with covered tables and restrooms has been developed at the back of the site.

Tawa, Pintado, Nizhoni, Whipple, and Lacey Points are each developed with a parking pulloff and interpretive viewpoint. The roadway surfaces, curbing, and walkways were all recently rehabilitated, and a project to replace the interpretive waysides is underway.

Puerco River Valley Interpretive Sites

The developments in this part of the park lie in the shortgrass prairie ecosystem:

Developed interpretive sites exist at the Puerco ruins and petroglyphs and the Newspaper Rock petroglyphs, both listed on the National Register of Historic Places. A new parking lot and barrier-free comfort station were recently completed at the Puerco ruins. The old comfort station, a rock building proposed for adaptive use as a visitor contact station, was studied for eligibility for the National Register of Historic Places and found to be ineligible.

The spur road and parking lot at Newspaper Rock were rehabilitated in 1985 and remain in good condition.

Two well houses have been constructed to serve groundwater sources on the Puerco River. Well number one is no longer in use, and that well house is used for storage associated with the operation of well number two.

Blue Mesa/Tepees

The top of Blue Mesa is part of the shortgrass prairie ecosystem. Gladiator milk vetch, a federal candidate threatened plant species, is known to occur on the mesa, and petrified wood is common.

Prehistoric and historic archeological sites, including Pueblo period rock art and rock shelters and the remains of the camps of early 20th century paleontologists, occur in the Blue Mesa vicinity. No archeological sites have been recorded within the proposed development area.

The Blue Mesa loop road is currently developed with three pulloffs for scenic overlooks and one trailhead with a parking lot. A paved loop trail descends from the top of the mesa down through an area of interesting badlands formations.

The nearby Tepees area has a parking pulloff, and a wayside is in preparation.

Agate Bridge

Agate Bridge is a natural petrified log bridge across a narrow ravine. In 1917 the railroad reinforced the bridge with a concrete pier to keep it from falling into the ravine. The pier is a massive structure that overwhelms the log and destroys its significance as a natural bridge. However, the pier may have historic significance as an early effort to preserve natural resources.

The site is developed with a parking lot, comfort station, and viewpoints overlooking Agate Bridge and a mesa escarpment. The comfort station was evaluated for possible inclusion on the National Register of Historic Places and determined to be ineligible.

Vegetation at the site is part of the shortgrass prairie ecosystem and includes gladiator milk vetch, a federal candidate threatened species.

Jasper Forest

A parking pulloff and interpretive overlook exist at this location. A new wayside exhibit is being prepared for the overlook.

Crystal Forest

A parking lot at this location was rehabilitated in 1985 and is in good condition. A new wayside exhibit is in preparation.

The Flattops

A parking pulloff, trailhead, and trail provide access to the Flattops and the wilderness area.

Giant Logs/Long Logs

The existing development at Giant Logs is situated in a desert shrub association on a terrace above Jim Camp Wash. The Giant Logs area immediately behind the visitor center contains excellent large cross sections of *Araucarioxylon*, including the largest diameter piece found to date in the park. Some of the logs have been moved from their original sites and otherwise degraded by development, including cement retaining walls and walkways. The ground through Giant Logs is littered with wood chips. A much larger area was probably covered with wood at one time, but theft and ground disturbance for development have depleted much of the original resource. Long Logs is a more natural and less disturbed wood site than Giant Logs. The existing development is a highly visible intrusion on both wood sites.

A possible relocation site for administrative development is in the shortgrass prairie association on the mesa northwest of the existing development. Several sites within this general area have been previously disturbed by park development and operations, including the water tank access road, the stables, and stock grazing.

The Giant Logs developed area serves as the southern entrance to the park and as a base of

operations for park staff. The existing facilities include

- an entrance station
- a visitor center and ranger station in one building (historically known as the Rainbow Forest Museum) with an adjacent interpretive trail through Giant Logs
- a gift shop and a 60-seat snack bar
- adjoining housing built around a courtyard, consisting of 6 two-bedroom units, 1 one-bedroom unit, and 1 one-room unit
- a two-unit concessioner residence
- a maintenance shop/firehouse
- a storage building
- a six-bay garage
- a picnic area
- a horse barn

The sewer system is marginally adequate for the existing loads.

The park road is currently routed through the parking lot in a confusing layout that causes conflicts between and potential hazards for pedestrians, people pulling out of parking spaces, and through-traffic.

Most of the structures date from the 1930s. The visitor center/ranger station (historically known as the Rainbow Forest Museum), the residences, and the maintenance buildings are all rustic sandstone structures. They are low and flat roofed, in the southwestern tradition, and the residences are oriented around a central patio, further carrying out the southwestern theme. The area's prehistoric and historic archeological sites include quarry areas and surface structures dating from the Pueblo period and remains of early park development.

The floodplain mapping accomplished to provide data for this planning effort discovered that the sewage lagoons serving this development are in the 100-year floodplain of Jim Camp Wash. The study was conducted along the reach of Jim Camp Wash that flows by the Giant Logs developed area. Water surface elevations and flow velocities for the 100-year and 500-year flood events were estimated using the U.S. Army

Corps of Engineers backwater computer model, HEC-2. Sixteen cross sections were surveyed and mapped across Jim Camp Wash from a point downstream of the sewage ponds to a point upstream of the highway bridge. The estimated flood flows of the reach are 3,450 cubic feet per second (cfs) for the 100-year flood and 5,875 cfs for the 500-year flood. The 100-year and 500-year floodplains are shown on the alternative maps. The results of this analysis indicate a threat from both 100-year and 500-year floods in the lower-lying portions of the Giant Logs developed area. The predicted flooding would result from backwater rising behind the low concrete box culverts in the highway bridge, which constrict the streamflow through that portion of the channel. Streamflow greater than 1,800 cfs would be shunted to the west into the existing parking lot, concession store, and concessioner housing area. Flow velocities would not be great (1-2 linear feet per second) because the major portion of the flow would still be contained in the channel. The floodplain study model showed that if the box culvert bridge was replaced by a single-span concrete bridge, the 100-year and 500-year flood events would flow under the bridge within the existing banks of Jim Camp Wash.

A natural channel constriction just downstream of the sewage ponds would cause water to back against the unprotected sand berm that separates the two ponds from the channel. Although neither the 100-year nor the 500-year flood is estimated to overtop the berm, velocities here might be strong enough to scour the unprotected berm and cause it to collapse, releasing sewage into the floodwater.

Visitor Use Data

Annual and monthly visitation figures are shown in tables 4-8.

Table 4: Park Use, 1989-90

1989	
January	22,288
February	25,121
March	56,748
April	57,195
May	74,798
June	135,804
July	143,289
August	127,467
September	74,696
October	62,372
November	35,345
December	<u>23,639</u>
Total	838,762

1990 *	
January	23,437
February	25,809
March	51,981
April	57,741
May*	119,534
June	117,879
July	140,807
August	142,304
September	68,967
October	59,376
November	32,443
December	<u>20,421</u>
Total	860,699

**Table 5: Total Annual Visits,
Painted Desert Visitor Center, 1980-90**

1980	298,534
1981	313,758
1982	303,344
1983	294,970
1984	296,679
1985	298,084
1986	318,365
1987	323,509
1988	282,001
1989	270,413
1990	251,622

**Table 6: Total Annual Visits,
Rainbow Forest Visitor Center, 1980-90**

1980	129,053
1981	152,260
1982	155,035
1983	174,835
1984	176,020
1985	216,420
1986	189,530
1987	183,521
1988	175,713
1989	181,579
1990	194,277

**Table 7: Wilderness Use
Number of User Days, 1980-90**

1980	700
1981	1,400
1982	700
1983	637
1984	618
1985	745
1986	849
1987	652
1988	681
1989	579
1990	682

Table 8: Vehicular Use, 1986-90

Year	Total	Buses	Other
South Entrance			
1986	66,902	429	66,473
1987	66,359	370	65,989
1988	71,724	340	71,384
1989	74,990	385	74,605
1990	71,345	432	70,913
North Entrance			
1986	103,164	450	102,714
1987	100,955	461	100,494
1988	107,801	474	107,327
1989	110,132	495	109,637
1990	101,283	427	100,856

The Region

Location

Petrified Forest is located in Apache and Navajo counties in northeastern Arizona. I-40 crosses the narrow neck of the park, and US 180 crosses the southern tip. The nearest towns are Navajo, 15 miles east of the north entrance, and Holbrook, 19 miles west of the south entrance.

Adjacent Land Use

The park is surrounded by a traditional checkerboard of public and private lands alternating in square-mile sections. Many landowners are seeking to consolidate or vacate holdings around the park in an attempt to block up land into larger, more manageable units.

Most of the lands adjacent to the park have been managed as part of large cattle ranches for the past 120 years. Both the state trust lands and the public domain lands administered by the Bureau of Land Management have traditionally been leased for grazing. Unimproved ranch roads, barbed-wire fences, earthen water impoundments called tanks, scattered windmills, and occasional corrals are the only developments that dot the landscape. This use of the land has preserved the scenic views seen from the park; however, their continued preservation is not ensured. More intensive land uses, such as subdivisions, railroad and natural gas facilities, and a proposed large landfill, are encroaching on the scene and threaten to significantly alter the scenic quality of many major park viewsheds.

Proposed Additions

The following text describes the parcels of adjacent lands containing significant paleontological and archeological resources

that warrant their inclusion in the park. These lands contain many paleontological and archeological field sites that could expand the research potential of the park. They also have interpretive, wilderness, and scenic values that would greatly enhance the visitor experience.

West Chinle Escarpment

Size. This parcel contains 16.25 sections (10,400 acres), all within Navajo County except for two sections in Apache County.

Paleontological Resources. Many fossil-bearing exposures occur throughout this parcel, and a number of fossil localities are known. One site is located on North Twin Butte and another site is on South Twin Butte. Eastward, along the escarpment, three other fossil localities have recently been discovered, and at the east end of the escarpment, before it turns south, several other sites are known. The potential for petrified wood and fossilized vertebrate bone material is high, and it is only a matter of systematically searching the area for more to be discovered. Where the escarpment trends south, petrified logs become numerous and many phytosaur chevrons indicate excellent potential for significant fossil resources.

Cultural Resources. The parcel has not been systematically surveyed for archeological sites, but several have recently been found. The butte and mesa tops at Ramsey Slide and the west Jasper Mesas may have Archaic camps and lithic work stations. Flatter areas probably have Anasazi homesites, indeed a few are known from the top of the escarpment. Petroglyphs are known to occur in the parcel, but the extent to which they occur is yet to be determined. Considering all the sandstone faces having desert varnish in the many side canyons of the escarpment, potentially many more petroglyph sites remain to be documented.

Natural Resources. This western portion of the Chinle escarpment is scenically similar to Blue Mesa in the park, but on a grander scale. The dramatic topographic sweep of land as it rises from the Puerco River is broken by huge sandstone blocks and rimrock badlands that ascend the escarpment like giant stairsteps, eventually topping out at 5,811 feet above sea level, more than 500 vertical feet above the river.

The Twin Buttes, both rising above 5,670 feet, stand detached from the escarpment as sentinels on the western end of the parcel. They trend north-south and form a natural western boundary to this scenic panorama. Directly south of Twin Buttes is the Ramsey Slide, a broken, visually intriguing section of the escarpment where the sandstone layers have eroded back, forming great benches and esplanades rimming five wide erosional amphitheaters. Within these amphitheaters, the fossil-bearing blue clay strata are exposed. East of Ramsey Slide the escarpment is steeper and higher, forming a ragged wall capped by sandstone that extends east for 3 miles, touching the park, then turns south for 1.5 miles before it turns east again and enters the park. These are the west Jasper Mesas, a series of scenic, steep-walled, flat-topped buttes and mesas that form the western edge of the Jasper Forest valley. These mesas are integral to half of the panorama visible to the west from the park road. As visitors travel south on the road, the Twin Buttes and the west Jasper Mesas catch their eyes long before they get to Blue Mesa or Jasper Forest. Drainage from the escarpment is by small tributaries to Dry Creek, which flow away to the north.

Vegetation below and above the escarpment is heavily grazed shortgrass prairie. Some pinyon-juniper woodland is on top of the escarpment. Large shrubs grow along the dry washes or cling to cliffs inaccessible to cattle. One remote canyon on the edge of the escarpment is known to have a relict shrub community that has not been impacted by cattle grazing. Potential habitat exists for both gladiator milk vetch and paper-spined cactus.

The distribution and abundance of pronghorn and other wildlife are unknown.

Legal Description. T17N R23E sections 1, 2, 3, 4, 5, E2 of 6, E2 of 7, 8, NW4 of 9, 12; T18N R23E sections 28, E2 of 29, E2 of 32, 33, 34, 35, 36; T18N R24E sections 31, 32

Ownership. T17N R23E sections 1, 3, 5, 7, 8, 9; T18N R23E sections E2 of 28, 29, E2 of 32, 33, N2 of 34, 35

Surface: Fitzgerald
Subsurface/Mineral: New Mexico & Arizona Land Co.

T18N R24E section N2 of 31

Surface: Valley National Bank
Subsurface/Mineral: Desarmo

T18N R24E section SE4 of 31

Surface: Valley National Bank
Subsurface/Mineral: unknown

T17N R23E section 2; T18N R23E section 36; T18N R24E section 32

Surface: state of Arizona
Subsurface/mineral: same

T17N R23E sections 4, E2 of 6, 12; T18N R23E sections W2 of 28, S2 of 34; T18N R24E section SW4 of 31

Surface: Bureau of Land Management
Subsurface/mineral: same

Totals

Private	6,080 acres
State	1,920 acres
BLM	<u>2,400 acres</u>
	10,400 acres

Modern Developments. The entire parcel has only light ranching developments. Two groups of tanks are in the parcel: the Dry Wash tanks at the extreme east end of the parcel and the Ramsey Slide tank on the top of the escarpment above Ramsey Slide. The

south boundary of this parcel was drawn to exclude the Delaney tank and the lower Delaney tank. One abandoned well (type unknown) is located on the mesa at the east end of the parcel. A radio repeater facility (NPS and Santa Fe Railroad) sits atop the highest butte and is served by a pole line from the park. Light ranch roads enter the parcel from the southeast, northwest and southwest. A short section of ranch road cuts across the northeast corner of the parcel near the Dry Wash tanks. Two abandoned mines (possibly uranium) are located in the two largest canyons that cut into the escarpment. Another mine site, condition unknown, is on the north side of North Twin Butte.

East Chinle Escarpment

Size. This parcel contains 88.25 sections (56,480 acres), all in Apache County.

Paleontological Resources. The eastern 11 miles of the Chinle escarpment, where the lateral exposures are continuous, is most likely the best exposure of this geologic sequence in the world. Although this parcel has not been researched extensively for fossil-bearing exposures, experts have made several field trips into this area in conjunction with this planning effort and are convinced that its paleontological resources are globally significant. One expert called the escarpment a scientific gold mine. Not only that, it has the potential to become the paleontological "gold standard" for the late Triassic, since the fossil-bearing exposures are more continuous than those inside the park, which are now setting the standard.

Petrified wood, fossilized bone, and shells are most common in the southwest quarter of the parcel, but they can be found at scattered locations throughout. In some places along the base of the escarpment, concentrations of petrified wood rival those now protected in the park. Surface wood used to be much more common, but petrified wood mining has been permitted here on leased land for many

years. Great mounds of petrified freshwater clam shells can be found, and blue and purple fossiliferous clay strata are common from Billings Gap east to Sorrel Horse Mesa and north to Blue Tank.

Cultural Resources. Archeological resources also abound on this parcel. Pueblo sites, lithic scatters, and petroglyph panels on the sandstone all indicate that the Ninemile Wash area was continuously populated like the Puerco River floodplain just to the north.

Natural Resources. The height of the east Chinle escarpment gradually increases from 50 vertical feet in the southwest corner of the parcel to 500 feet in the southeast corner. The escarpment is not as visually striking here as it is in the west parcel; however, the steep slopes of Sorrel Horse Mesa, a disjunct remnant jutting a mile north of the escarpment, commands the view for miles around. Steeply sloping clay walls, 150 to 170 feet high, protected by a thick cap rock of sandstone, rise abruptly from the plain. East of Sorrel Horse Mesa the escarpment begins to arc gently to the northeast, eventually ending 2 miles east of Ninemile Seep. The escarpment here is about 500 feet high, but it spreads out over a mile in width, so the landscape does not appear to be an escarpment so much as a vast eroded basin. The escarpment is deeply incised by steep, barren gullies devoid of all vegetation, indeed, apparently devoid of all life. However, these badlands hold the best record of life on Earth some 230 million years ago.

The landscape in the drainage of Saddle Horse Draw is characterized by wide open prairie gently sloping down to the Puerco River. Here and there squat mesas and meandering sandstone rimrock punctuate the prairie, disclosing the exposures of a lower stratum of the Chinle formation. Major vistas from Blue Mesa, Agate Bridge, and the Puerco ruins overlook this immense area. The clear, dry air diminishes the sense of distance, and the sweeping eastward arc of the Chinle escarpment looks quite close, within a half hour's walk from Blue Mesa, but

in reality it stretches away to the east until detail fades and the brilliant reds, browns, blues, and purples of the banded clay blend with the green junipers on the highest slopes.

In the west part of the parcel, the escarpment is breached at Billings Gap by a small tributary of Ninemile Wash. The extreme southwestern corner of the parcel is drained by the east fork of Dry Wash. The remaining major portion of the parcel, about 61 square miles, is drained by Ninemile Wash (which is actually 16 miles long). Ninemile Wash is the largest drainage entering the park from the southeast and has its confluence with the Puerco River less than ½ mile above the park's only well. The northern third of the parcel is drained by Saddle Horse Draw, a 10-mile long intermittent wash that parallels Ninemile Wash and empties into the Puerco River near Bar-in-Well about 2.5 miles above Ninemile Wash.

The northern third of this parcel is vegetated with shortgrass prairie, but the southern two-thirds is mostly barren clays with some pockets of prairie. This is poor range for cattle, but pronghorn frequent the area. The highest reaches of the drainage, in the vicinity of Ninemile Seep, support a healthy juniper woodland. The lower reaches of Ninemile Wash and its tributaries and portions of the Puerco River floodplain are choked with the alien tamarisk. This species has grown so thick in lower Ninemile Wash that it has eliminated native vegetation altogether. Tamarisk is a water-waster, and its elimination must be considered as part of any water management plan for the drainage.

Legal Description. T17N R25E section 6; T18N R24E sections 1, 2, S2 of 3, NW4 & E2 of 10, 11, 12; T18N R25E (all); T18N R26E sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 28, 29, 30; T19N R24E section S2 of 36; T19N R25E sections 25, 26, 27, 28, S2 of 29, 31, 32, 33, 34, 35, 36; T19N R26E sections 27, 28, 29, 30, 31, 32, 33, 34, 35, 36

Ownership. T18N R24E sections 1, 11; T18N R25E sections 7, 19, 31; T19N R25E sections S2 of 29, 31

Surface: McCauley, Valley National Bank, McKeckne
Subsurface/mineral: R. Muse III

T18N R24E section S2 of 3

Surface: Valley National Bank
Subsurface/mineral: Peck

T18N R25E sections 1, 3, 5, 9, 11, 13, 15, 17, 21, 23, 25, 27, 29; T18N R26E sections 5, 7, 17, 19, N2 & SW4 of 29; T19N R25E sections 25, 27, 33, 35; T19N R26E sections 29, 31

Surface: Valley National Bank
Subsurface/mineral: Hortenstine

T18N R25E sections 33, 35; T18N R26E sections 1, 3, 9, 11, 15, 21, SE4 of 29, 31; T19N R26E sections 27, 33, 35

Surface: Spurlock
Subsurface/mineral: Unknown

T17N R26E section 6; T18N R24E sections 2, 12 (240 acres); T18N R25E sections 2, 4, 6 (320 acres), 8, 10, 12, 14, 16, 20, 22, 24, 26, 28, 32, 34, 36; T18N R26E sections 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 28, 30, 32; T19N R24E section S2 of 36; T19N R25E sections 26, 28, 32, 34, 36; T19N R26E sections 28, 30, 32, 34, 36

Surface: state of Arizona
Subsurface/mineral: same

T18N R24E sections N2 & SE4 of 10, 12 (400 acres); T18N R25E sections 6 (320 acres), 18, 30

Surface: Bureau of Land Management
Subsurface/mineral: same

Totals

Private	27,520 acres
State	26,480 acres
BLM	<u>2,480 acres</u>
	56,480 acres

Modern Developments. Modern developments commonly associated with large-scale cattle ranching are found throughout the parcel. Nine cattle tanks and adjacent corrals are spread along the foot of the escarpment and out to Ninemile Wash. These are all earthen dams on intermittent tributaries to Ninemile Wash and Saddle Horse Draw. Ninemile Seep is the only named spring in the parcel, but West Ninemile Well is nearby, and three water tanks are on the flat mesa between the headwaters of Ninemile Wash and Saddle Horse Draw. The only other water well on the parcel is Bar-in-Well, which is a windmill and small tank in the Puerco River aquifer. In the far northeast corner of the parcel a helium well has been drilled in the headwaters of Saddle Horse Draw. Its activity and condition are unknown. In the far southwest corner an old rock quarry is located on Black Knoll, a volcanic outcrop, but it is not large or visible from most of the area below the escarpment. Many ranch roads (dirt tracks) connect the cattle tanks and provide access throughout the parcel. Ranch roads also follow the escarpment rim. Two roads enter the park from the parcel, one near the mouth of Ninemile Wash and the other southeast of Blue Mesa.

West Rim Painted Desert

Size. This parcel is 12.375 sections (7,920 acres), all within Navajo County.

Paleontological Resources. The southern third of the parcel contains several fossil beds that are adjacent to the very significant Devils Playground bone site, just inside the park. The mesas above Lithodendron Wash have huge petrified logs and fossil bone scatters. The remaining two-thirds of the parcel has potential for fossil sites dating from both the

Carnian and Norian ages of the Triassic period.

Cultural Resources. The parcel has never been systematically surveyed for archeological sites; however, the potential is good, judging from what is known to date. Three ruins, each associated with a drainage, and other, less conspicuous homesites and campsites are known to occur on the parcel, along with a petrified wood quarry presumably used for weapon and tool manufacture. A petroglyph site is also known. An archeological survey would certainly discover more sites.

Natural Resources. The landscape in this parcel is of the same quality as the Painted Desert scenery in the park. Indeed, it is simply the logical extension of the boundary westward to include the west rim of the Painted Desert badlands. The landscape can be characterized as a series of small mesas and rimrock escarpments that are north of I-40 and front on the west bank of Lithodendron Wash. A little farther north the terrain changes to the steeply gullied barren clay strata of the badlands in Painted Desert. The next 4 miles north contain the headwaters of these gullies on the west rim of the Painted Desert. This area can be clearly seen by most visitors who stop along the park road at Pintado and Nizhoni viewpoints. Two miles north of the headwaters of Wildhorse Wash the terrain drops down into Digger Wash, which flows out of the Painted Desert badlands. The next 3 miles north to the Navajo Reservation are comprised of sinuous badlands topography interspersed with stretches of fairly level shortgrass prairie northwest of Pilot Rock.

The area is adjacent to the Painted Desert wilderness, and its isolation, solitude, and lack of development appear to make it potentially suitable for inclusion in wilderness. Wildlife data are not available for the parcel. The rare gladiator milk vetch is known to occur on the mesas west of Lithodendron Wash in the south part of the parcel.

Legal Description. T19N R23E sections 4, E2 of 5, 9, 16, 21, 22 (560 acres), 28; T20N R23E sections 4, 9, 16, 21, 28, 33

Ownership. T19N R23E, sections E2 of 5, 9, 21

Surface: Sun Country Ranches (subdivision)

Subsurface/mineral: Santa Fe Railroad and private, unknown

T20N R23E, section 9, 21, 33

Surface: Jeffers

Subsurface/mineral: private, unknown

T19N R23E sections 4, 16; T20N R23E sections 4, 16, 28

Surface: state of Arizona

Subsurface/mineral: same

T19N R23E sections 22 (560 acres), 28

Surface: Bureau of Land Management

Subsurface/mineral: same

Totals

Private	3,520 acres
State	3,200 acres
BLM	<u>1,200 acres</u>
	7,920 acres

Modern Development. Developments on this land are relatively few, even for ranching, because of the extensive percentage of badlands in the parcel. In the southern part of the parcel, a jeep trail goes out to four prospects, which may only be uranium claims. A ranch road enters the parcel from the west near Rim Tank, which is outside the parcel. A drill hole (perhaps for water or gas) is nearby, but no development has taken place. A small, unnamed tank is perched near the west rim at the end of the ranch road. Ranch roads also enter the parcel on the rim above Wildhorse Wash and at the extreme north end in the vicinity of Little Rabbit Tank. Indications are that cattle grazing is confined to the shortgrass prairie above the rim, and

what improvements there are not intrusive. Five of the 12 sections in the parcel have no developments at all.

Rainbow Forest Badlands

Size. This parcel is three sections (1,920 acres), all within Apache County.

Paleontological Resources. This parcel takes in the southernmost extension of the fossil-bearing strata that extend south from Long Logs. Vertebrate bone has been found nearby on park land.

Natural Resources. This area is an extension of the badlands that march south from the Rainbow Forest wilderness, eventually grading into rolling plains near US 180. A series of four small, roughly parallel intermittent drainages flow south through the area, making the view from the south and west one of gently rolling plains with badlands rising to the north. Wilderness values are present over most of the parcel. The vegetation is a blend of shortgrass prairie and mixed desert shrub. Most of the northern part of the parcel is barren badlands. Habitats for the rare gladiator milk vetch and paper-spined cactus are present. Pronghorn from the park herd utilize the area.

Cultural Resources. No archeological sites have been documented on this parcel; however, the presence of Anasazi homesites on adjacent park land makes their occurrence on the parcel likely.

Legal Description. T16N R24E sections 16, 17, 18

Ownership. T16N R24E section 17

Surface: New Mexico & Arizona Land Co.

Subsurface/mineral: same

T16N R24E sections 16, 18

Surface: state of Arizona

Subsurface/mineral: same

Totals

Private	640 acres
State	<u>1,280 acres</u>
	1,920 acres

Modern Developments. An abandoned portion of old US 180 crosses the west half of the parcel, and the present US 180 alignment crosses the extreme southwest corner of the parcel.

Dead Wash Petroglyphs

Size. This parcel is 22.93 sections (14,680 acres), all within Apache County.

Cultural Resources. The rock art panels in this parcel may be associated with McCreery Pueblo, with centuries-old pilgrimage and hunting routes, and with more recent Navajo occupation. The excellent workability of the sandstone permitted experimentation, both stylistically and technologically, that resulted in these being some of the most unusual petroglyphs in the Southwest. The stark visual contrast between the unworked heavily patinated sandstone and the almost white interior of the freshly pecked rock makes this art all the more impressive (Martyneec 1985).

This parcel also contains many known lithic scatters, homesites, and pueblos. It is suspected that systematic surveys of the parcel would yield hundreds of more sites. A historic inscription is found at one petroglyph site.

Paleontological Resources. Clam beds, two types of petrified wood occurring as large logs and scattered chips, and vertebrate bone material are found in the parcel. Most localities are associated with the cliffs and breaks on either side of Dead Wash, where the Chinle formation is exposed. Access for paleontological research is extremely limited. Surveys would have to be mostly on foot.

Natural Resources. This parcel takes in the entire Dead Wash drainage from just south of I-40 to its confluence with the Puerco River at

the current park boundary. Its southern boundary is along the Santa Fe Railroad alignment parallel to the Puerco River.

South of I-40 a series of rugged badlands form wide benches that descend to the west bank of Dead Wash. Within these badlands are a half dozen rincons rich in archeological and paleontological sites. Dead Wash itself has a wide, intermittently flowing bed that has cut through the Chinle formation to the level of the Puerco River where it crosses the park. Dead Wash is the major drainage coming into the park from the northeast. It is sometimes called Dead River. In this parcel, Dead Wash roughly parallels the Puerco River for several miles, separated from it by a wide, low ridge. Vegetation is almost all shortgrass prairie, but barren badlands are found west of the wash. Habitat is marginal for gladiator milk vetch and paper-spined cactus. Heavy grazing pressure may have eliminated some populations of these plants in this parcel.

Legal Description. T18N R24E sections N2 of 3; T19N R24E sections 1, 11 (400 acres), 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 34, 35, N2 of 36; T19N R25E sections W2 of SW4 of 5 (80 acres), 6 (480 acres), 7, 8, 17, 18, 19, 20, N2 of 29, 30

Ownership. T18N R24E section N2 of 3

Surface: Valley National Bank
Subsurface/mineral: Santa Fe Railroad
or Peck

T19N R24E sections 1, 11 (400 acres), 12, 13, 14, 15, 23, 25, 27 (600 acres), 34, 35;
T19N R25E sections N2 of 29, 30

Surface: Stonewood Ranches
(subdivision)
Subsurface/mineral: Santa Fe Railroad,
Muse III, and United States (part
sec.30)

T19N R24E section N2 of 36

Surface: state of Arizona
Subsurface/mineral: same

T19N R24E sections 22, 24, 26; T19N R25E sections 5 (80 acres), 6 (480 acres), 7, 8, 17, 18, 19, 20

Surface: Bureau of Land Management
Subsurface/mineral: same

Totals

Private	8,040 acres
State	320 acres
BLM	<u>6,320</u> acres
	14,680 acres

Modern Developments. For a parcel this size so close to rail and highway, surprisingly few modern developments have been built. Five dirt ranch roads enter the parcel from all sides but the south. None of them penetrate more than 1.5 miles into the parcel. Three windmills have been erected along Dead Wash, and another is near the Puerco River. An abandoned line of power poles cuts from west to east across the northern third of the parcel, south of I-40.

Wallace Tank Ruin

Size. This parcel is six sections (3,840 acres) in two small units, both in Apache County. The northern unit is 4.5 square miles and the southern unit is 1.5 square miles.

Cultural Resources. The gentle grass-covered hills of this region were important to ancient farmers, especially if water was nearby. Ruins of their homes and villages are scattered throughout the grasslands. The ruins of the last and one of the largest of these villages, the Wallace tank ruins, are in the northern unit a short distance east of the current park boundary, on private land. Larger than the Puerco ruins, these ruins contain at least four separate room blocks around a plaza, outlying structures, and three separate cemeteries. Ceramic analyses show a probable occupation between A.D. 1300 and A.D. 1450, which would have extended approximately 50 years later than the occupation of the Puerco ruins. Since very little was left in any of the rooms at Puerco, it

is suspected that its residents packed up their belongings and left peaceably, and Wallace tank may be one of the pueblos to which they moved. The population probably had direct contact with other pueblos at Zuni, Hopi, and Homol'ovi.

The ruins have been subjected to vandalism, but important information remains. The ruins represent the last chapter of the Anasazi history of Petrified Forest National Park. Four Anasazi homesites are known to exist in the southern unit, and many more are expected to be found.

Paleontological Resources. The northern unit has several known sites of petrified logs and vertebrate bone material. Much of this is exposed from the erosion of the escarpment in this area. The southern unit contains badlands that have yielded petrified wood and fossil bones. Undoubtedly there is more to discover in these areas, and both units could hold significant fossil resources.

Natural Resources. The northern unit contains the eroded Chinle escarpment that runs from Agate Bridge across to the Cedar Tank area. In this parcel, a large tributary of the east fork of Dry Wash has breached the escarpment, carving out a wide floodplain that drains the whole parcel. It is a remote place; quiet and lonely. The softened, eroded forms of the prairie hills stand in contrast to the steep, angular escarpments to the east and west of the parcel. Solitude is an attribute of this parcel. This area is directly in view from Blue Mesa and Agate Bridge.

The southern unit is like a miniature edition of the northern unit. It is drained by the upper reach of Teds Wash. Elevations are high at the north end, nearly 5,700 feet above sea level. This 1.5-square-mile area of shortgrass prairie at the southern end of Puerco Ridge is very important to the visual integrity of the adjacent Rainbow Forest wilderness area, which is very narrow at this location.

Vegetation on both the north and the south units of the parcel is a patchwork of heavily

grazed shortgrass prairie and mixed desert shrub, with the grassland predominating. Potential habitat exists for both the gladiator milk vetch and the paper-spined cactus. Pronghorn from the park herd utilize these areas, but to what extent is unknown. The northern unit has a large prairie dog town.

Legal Description. T16N R24E section E2 of 3; T17N R24E sections 1, E2 of 2, E2 of 11, 12, 13, E2 of 14, 34

Ownership. T16N R24E section E2 of 3; T17N R24E sections 1, E2 of 11, 12, 13, E2 of 14, 34

Surface: New Mexico & Arizona Land Co.

Subsurface/mineral: same

T17N R24E section E2 of 2

Surface: state of Arizona

Subsurface/mineral: same

Totals

Private	3,520 acres
State	<u>320 acres</u>
	3,840 acres

Modern Developments. Three tanks occur on the northern unit of the parcel, Wallace tank, west tank, and a small unnamed tank. Four miles of unimproved dirt-track ranch roads thread through the north unit. Only a half mile of ranch road cuts through the southeast part of the south unit traveling from the south tank to the twin tanks.

Canyon Butte Ruin

Size. This parcel is four sections (2,560 acres), all in Navajo County.

Cultural Resources. To date many Anasazi homesites are known from the area. The Canyon Butte ruin, which is perhaps a Hopi or early Navajo site, and the so-called flagstone site with its three panels of

petroglyphs are found in the parcel. A systematic survey would undoubtedly yield many more archeological sites.

Paleontological Resources. Paleontological resources in this parcel are not well known, but some fossiliferous geologic strata are found in the southeast corner of the parcel.

Natural Resources. The topography of this parcel can be characterized as a southeast-northwest trending series of squat mesas starting in the park at the Flattops and continuing northwest for five miles to the vicinity of the Delaney tank. The expanse between these 15 or so mesas is uninterrupted shortgrass prairie stretching away to the northwest at an average elevation of around 5,600 feet above sea level. The mesas stick up above the prairie for another 60 or 70 feet. Further north, in the west Jasper Mesas, the radio repeater facility on the highest mesa creates a scenic intrusion.

Two tributaries of Carr Lake Draw originate in this parcel, one in the extreme north end and the other in the extreme south end. Pronghorn from the park herd utilize the area, but to what extent is unknown. Marginal habitats for the rare gladiator milk vetch and the paper-spined cactus occur in the parcel. Past grazing may have eliminated populations in the area.

Legal Description. T17N R23E sections 13, 14, 24, 25

Ownership. T17N R23E, sections 13, 14, 24, 25

Surface: Fitzgerald

Subsurface/mineral: New Mexico & Arizona Land Co.

Total

Private	2,560 acres
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Modern Developments. Two ranch roads enter the parcel from the north, one of which parallels the park boundary for 2 miles. The

park's water line and access road leading from the Puerco River south to the Giant Logs development area cut diagonally across section 25, outside the park. This is the only place where the park's water line is outside the park.

Regional Housing Opportunities

Holbrook, population 5,000 in 1990, is 23 miles west of park headquarters and 19 miles west of the southern park entrance. A survey of the Holbrook housing market conducted in the spring of 1989 sampled 44 houses for sale. The sizes and asking prices are summarized in table 9. It has been difficult for park employees to find adequate, affordable rental housing in Holbrook, in part because park employees must compete with employees of the Air Force's Detachment 2 of the 1st Electronic Combat Range Group, Strategic Air Command, based in Holbrook. The Air Force is looking into rental contracts for housing on the open market, which would make rental housing even harder to find than it has been in the past.

Regional Recreation and Tourism

Regional recreation and tourism are oriented toward Grand Canyon and several other units of the national park system, the national forest lands south of the Little Colorado River valley, and increasingly toward the Indian reservations. The Navajo, Hopi, and Zuni tribes are landowners in the region, and many opportunities exist around the park to provide cultural demonstrations and interpretation of the traditional lifeways of native peoples. Native dances are currently performed at the two rock shops near the park's south entrance. The Arizona Office of Tourism plans to build a welcome station on I-40 east of the park to orient visitors to the many natural and cultural attractions they can see and participate in while touring northeastern Arizona.

It has been estimated that visitors to Petrified Forest spent an estimated \$11.8 million in 1988 for services such as food, gifts, lodging, and transportation. This direct import revenue induced additional spending by travel industry business operators and their suppliers that increased the total visitor-related sales to an estimated \$17.8 million. This economic activity contributed an estimated \$1.1 million to the local tax base (NPS 1989b). Conditions in northeastern Arizona favor the expansion of tourism programs and facilities. However, opportunities to develop tourist-oriented services along I-40 are governed by the distribution of interchanges, which in this part of the country are few and far between. Gas, food, and lodging are available in the small communities of Navajo and Chambers, 15 and 20 miles east of the park, respectively, and in the Holbrook area, 23 miles west of the park. The nearest commercial facilities outside the park are on US 180 immediately outside the south park entrance. They consist of two rock shops and a recreational vehicle campground.

Petrified Forest is still remote in respect to the viability of any commercial schemes in the area. The possibility of providing overnight accommodations in the park was studied by the concessioner but determined to be economically infeasible at this time (see "Alternatives Considered But Rejected"). Not much commercial development is anticipated close to the park in any case because of a scarcity of potable water. Future commercial development is expected to grow eastward from Holbrook, clustering in nodes around the I-40 interchanges, and in the Navajo Reservation east of the park, also near the I-40 interchanges.

Regional Threats to Environmental Quality

Distant commercial activities distributed across the Little Colorado River valley have potential to adversely affect park resources. A coal-fired power plant near Joseph City, 30 miles west of the park, and a paper mill about

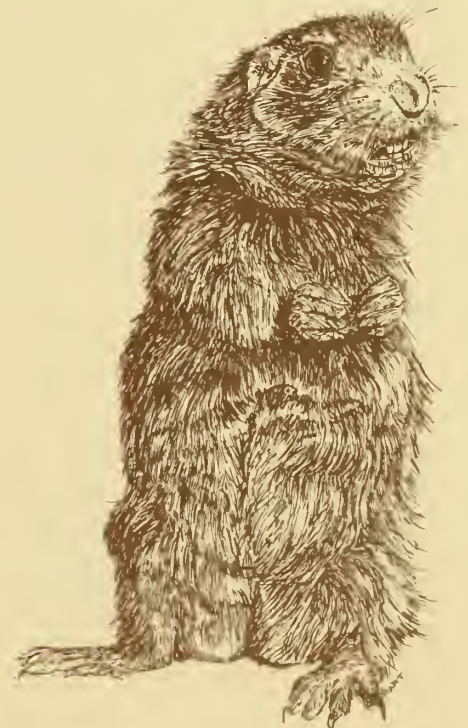
**TABLE 9: HOLBROOK HOUSING MARKET DATA
(SPRING 1989)**

SIZE	NO.	PRICE RANGE	AVERAGE PRICE
two-bedroom	7	\$30,000-\$45,000	\$38,000
three-bedroom	30	\$32,000-\$79,000	\$53,500
four-bedroom	6	\$57,000-\$140,000	\$102,500
five-bedroom	1		\$130,000

60 miles southwest of the park contribute to the regional haze, as does air pollution being blown in from southern California and northern Mexico. Radioactive material from a spill of mine tailing wastes many years ago near Gallup has been moving slowly down the Puerco River and has shown up in some groundwater sources. It is not considered a

present threat to the park's only well, but it could potentially contaminate that source at some time in the future. However, most of the radiation and heavy metals pollution in the Puerco River is from the long-term discharge of mine wastewater rather than from the single spill mentioned above.

Part Four: Description and Environmental Consequences of the Proposal and Alternatives



Description of the Alternatives

Alternative 1: No Action

Visitor Use

Existing patterns of visitor use would continue. Visitors arriving at either the north or the south entrance would receive basic orientation to an auto tour incorporating stops at a number of wayside exhibits at the major resource sites. The exhibits at each site would focus on what was most significant about that resource.

Resource Management

Paleontological Resources. Academic research in the park would continue to be coordinated by a park staff generalist in consultation with an advisory group made up of noted paleontologists from several regional institutions with an interest in the Chinle formation. Little research would be initiated or funded by the National Park Service. Most would continue to be accomplished by outside institutions who requested and received NPS research permits. Through the permit process, these institutions would agree to publish their findings and to provide the National Park Service with information it could use in resource management and interpretation in exchange for the opportunity to excavate and study park resources. Fossils would usually be removed from the park and added to the collections of the excavating institutions. The National Park Service would retain jurisdiction over the resources and could direct that they be relocated to another appropriate institution if the original institution violated the terms of its permit.

It would be possible to reorient the park's research program on a programmatic level, by establishing a professional liaison position on the park staff and providing funding for contract work through a university cooperative park studies unit or a regional service center similar to the National Park Service's cultural

resource centers. Such a program would help ensure that research conducted in the park would benefit park management and interpretive programs. However, most fossils excavated from the park would continue to be removed to outside collections.

Natural Resources. Natural resources would be managed under the ongoing resource management program. The park's shortgrass prairie ecosystem, which is recovering from overgrazing better than anywhere else in northeastern Arizona, would be encouraged through revegetation of areas disturbed by foot or vehicle traffic, removal of alien plant species wherever practicable, and maintenance of boundary fencing to protect native plants and animals from competition by trespassing livestock.

Surveys would be conducted to identify potential habitat for rare plants. Known populations of gladiator milk vetch and paper-spined cactus would be monitored, and visitors would be directed away from habitat areas.

Fire that threatened life, property, or cultural resources would be suppressed. Wildland fires in natural areas would be contained by roads or natural firebreaks, such as barren areas, rim rock, and dry washes. All fires would be suppressed with techniques that caused the least damage to natural and cultural resources.

A study would be conducted to identify adverse effects on the existing designated wilderness and to determine the suitability of redrawing the boundary of the Rainbow Forest wilderness unit.

The park staff would establish a data base of air quality and related values adequate to comply with the requirements of the Clean Air Act. The air quality program would include research on pollutants and their effects upon the park's natural and cultural resources.

Cultural Resources. Archeological sites would be managed through an ongoing program of conservation, protection, public education, and interpretation. A planned, phased research program would be initiated to complete the data base. Resources would be evaluated, and those that appeared to be potentially eligible would be considered for nomination to the National Register of Historic Places. An ongoing evaluation/monitoring program would be continued to determine the extent and nature of looting, vandalism, and site erosion, and priorities for protective measures would be established based on site integrity and vulnerability. The Puerco ruins and petroglyphs, Newspaper Rock, and the Santa Fe Railroad tracks would be interpreted using techniques that would protect the resources.

A historic resource study would be conducted to identify historic sites, structures, and objects; define significant themes; and determine potential eligibility for the National Register of Historic Places. The Painted Desert Inn, a national historic landmark, would be preserved and interpreted from the exterior.

Park Operations

Existing staffing and facilities would be retained.

Development

The no-action alternative would retain all of the existing park development, which is described in detail in the "Affected Environment" section of this report and summarized in table 10 at the end of this section.

The visitor contact station, concession cafeteria and gift shop, NPS administrative offices, park maintenance facilities, and NPS and concessioner employee housing would remain at the headquarters site. Structural

problems would be addressed through continuous repair.

Parking pulloffs would be retained at Tiponi, Tawa, Kachina, Chinde, Pintado, Nizhoni, Whipple, and Lacey points. Trail access to the floor of the Painted Desert would be available at Kachina Point, and picnic sites would be retained on Chinde Point. New interpretive wayside exhibits would be retained. The Painted Desert Inn on Kachina Point would be preserved, but it would not be open for public use under this alternative.

The new parking lot, wayside exhibits, and comfort station at the Puerco ruins would be retained. Trailhead parking and trails into wood sites would be retained at Blue Mesa, Crystal Forest, and Log Logs. Parking pulloffs with wayside exhibits would be retained at the Tepees, Agate Bridge, and Jasper Forest. The main trailhead for the Rainbow Forest wilderness would remain at the Flattops.

Visitor facilities at Giant Logs would continue to include a visitor center and a concession cafeteria and gift shop. The ranger station would remain in the same building with the visitor center, and the existing employee housing and maintenance facilities would be retained.

Boundary Changes

The National Park Service would not request any boundary adjustments. Concern over closely related paleontological, archeological, and scenic resources outside park boundaries would be addressed by initiating cooperative agreements with private landowners, Indian tribes, and federal and state agencies to increase resource protection.

Alternative 2 (Proposal): Increase Emphasis on Protection, Research, and Interpretation of Globally Significant Resources

Alternative 2 is the National Park Service's proposal for the draft general management plan. It is described in detail in part two of this document and summarized below for purposes of comparison with the other alternatives.

Visitor Use

The three geographic areas of the park – the Painted Desert, Puerco River valley, and Rainbow Forest – would each be used differently to provide visitors with a varied experience as they traveled through the park. In the Painted Desert unit visitors would get an introductory overview of Earth history at a new visitor center near Tiponi Point and a series of existing scenic overlooks on the rim of the Painted Desert. Part of a new research facility would also be open to the public. A coffee shop and gift shop would be provided near the visitor center. The Painted Desert Inn on Kachina Point would be rehabilitated and opened to the public for scenic viewing and interpretation. A picnic area would be provided on Chinde Point.

In the Puerco River valley, new wayside exhibits and a small visitor contact station at the Puerco ruins would interpret the modern landscape and the cultural history of the area.

In the Rainbow Forest area, a remodeled visitor center and guided tours of fossil sites would help visitors experience fossils close up. A trail would lead from the visitor center to the Long Logs site, and the road to that site would be obliterated. The existing concession would be replaced with a smaller facility offering light refreshments.

The wilderness trailhead at the Flattops would be closed. Interpretive pulloffs would remain at Crystal Forest, Jasper Forest, Agate Bridge, and the Tepees. Blue Mesa would be

improved for day use with picnic facilities and a variety of hiking opportunities.

Resource Management

Paleontological Resources. A paleontological research center would be established in the park to direct scientific inquiry into the Triassic environment of the Chinle formation. The center would support coordinated, long-term research activities, such as quarry operations in the bone beds, and it would provide the facilities needed to care for park resources on site. Compatible uses of the center would include archeological research, conferences, workshops, environmental education classes, and interpretive programs.

Natural Resources. The ongoing resource management program would be continued, as described for alternative 1.

Cultural Resources. The park's archeological sites would be managed as described for alternative 1. Interpretation would be expanded to include the 35th Parallel transportation route and traces of Route 66, in addition to the Puerco ruins and petroglyphs, Newspaper Rock, and the Santa Fe Railroad tracks.

A historic resource study would be conducted as described for alternative 1. The Painted Desert Inn National Historic Landmark would be rehabilitated and returned to use for interpretation. Art exhibits and cultural demonstrations would be offered. The park's cooperating association would operate a small sales outlet.

Park Operations

The park administrative offices and maintenance facilities would be replaced and expanded as necessary. Most would be replaced on the existing sites, but the maintenance facilities at Giant Logs would be relocated outside the prime resource area.

Park housing at the headquarters would be replaced and expanded on site. Park housing at Giant Logs would be replaced with a new housing/maintenance complex to be developed on the mesa top northwest of Giant Logs.

Development

The development associated with alternative 2 is described in detail in part two of this document and summarized and compared to the other alternatives in table 10.

Boundary Changes

Under this alternative the National Park Service would seek a boundary change to protect highly significant paleontological and archeological resources. Lands that would be added to the park under this alternative are shown on the Proposed Boundary Changes map in part two of this document and described under "Proposed Additions" in part three. All the additions would be contiguous and feasible to administer. If included in the park, these lands would be managed primarily for paleontological and archeological resource preservation, research, and interpretation. The minimum interests required for preservation management would be determined through a land protection plan. The new park lands would also be studied for wilderness suitability and feasibility.

Alternative 3 (Development Option): Minimum Requirements

Alternative 3 is a development option that would maximize the preservation of existing structures and minimize new land disturbance. All existing facilities would be retained at their existing locations, where they would be reconstructed and expanded as necessary.

Development

Headquarters/Tiponi Point. The visitor center, gift shop, cafeteria, administrative offices, maintenance facilities, and housing would all be redesigned and reconstructed in the same general area. The visitor center would be expanded to 11,000 square feet, and a 500-square-foot addition would be added to the concession building. A new 8,000-square-foot research center would be added adjacent to the visitor center. The administrative offices, maintenance facilities, and housing would be replaced and expanded on site (see table 10).

There would be no change at Tiponi Point in this alternative. The existing parking pulloff and viewpoint would be maintained.

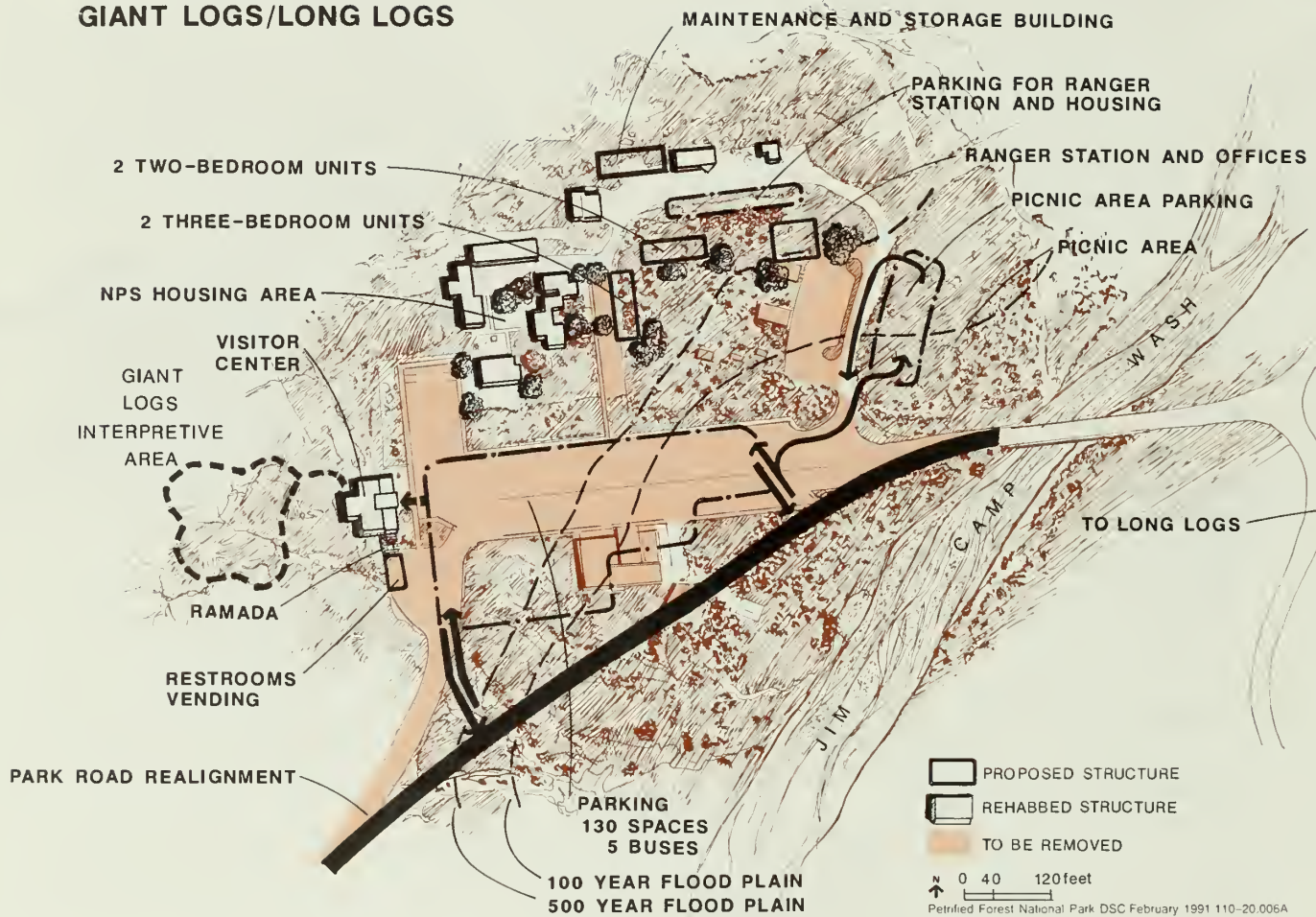
Giant Logs/Long Logs. All the existing buildings except the two concession buildings would be retained. The visitor center/ranger station would be renovated for exclusive use as the new visitor center, and the Giant Logs interpretive trail behind the center would be improved to make it less intrusive. A small building with restrooms and vending machines would be built adjacent to the visitor center, and a ramada structure would connect the two facilities. A new ranger station would be built, and a separate parking lot would be constructed for this facility. A new maintenance/storage building would be provided.

Two two-bedroom and two three-bedroom residences would be added to the existing NPS residential complex, and the existing units would be renovated and used for seasonal housing. No concessioner housing would be needed under this option. The new structures would be sensitively designed to be compatible with the existing building complex. No action would be taken to restore the 1930s appearance of the existing structures, since the removal of room additions, solar panels, swamp coolers, and other nonhistoric intrusions would decrease the structures' usefulness for housing.



ALTERNATIVE 3 HEADQUARTERS/TIPONI POINT

ALTERNATIVE 3 **GIANT LOGS/LONG LOGS**



Better separation of visitor use and park operations would be achieved through vegetative and structural screening and by relocating the picnic area to the other side of the main park road, to a more scenic site overlooking Jim Camp Wash.

The existing concession building and the concessioner residence would be removed. The access and parking situation would be improved by realigning the road to run south of the parking lot and by redesigning the parking lot configuration, taking advantage of the site vacated by the existing concession building. The existing bridge over Jim Camp Wash would be retained. The Long Logs parking lot would be retained, and visitors would continue to drive to that resource.

The sewage lagoon would be floodproofed.

Alternative 4 (Development Option): Reduce Development at Giant Logs

Alternative 4 is another development option for Giant Logs. Under this option, a new 3,500-foot visitor center would be constructed to provide adequate space for the proposed uses for that facility. To tie the center more closely to the Long Logs area and to create a better orientation for visitors approaching from the south, the center would be relocated to the eastern side of the developed area, but still on the north side of the road, outside the floodplain of Jim Camp Wash (see the Giant Logs/Long Logs development map). A new 0.75-mile barrier-free trail would lead from the visitor center, across a foot bridge over Jim Camp Wash, to Long Logs. The existing parking lot at Long Logs would be removed, and the area would be managed as a quieter, more secluded walk-in site available to visitors with the time and inclination to travel away from the road corridor.

A small snack bar would be built adjacent to the visitor center. The new concession facility would be much smaller in scale and designed to complement, rather than compete with, the visitor center. A plaza shaded by ramadas

would provide an outdoor seating area between the two buildings. The picnic area would be relocated a little to the north, and the tables would be covered with ramada-type structures similar in style to the ramada adjacent to the visitor center.

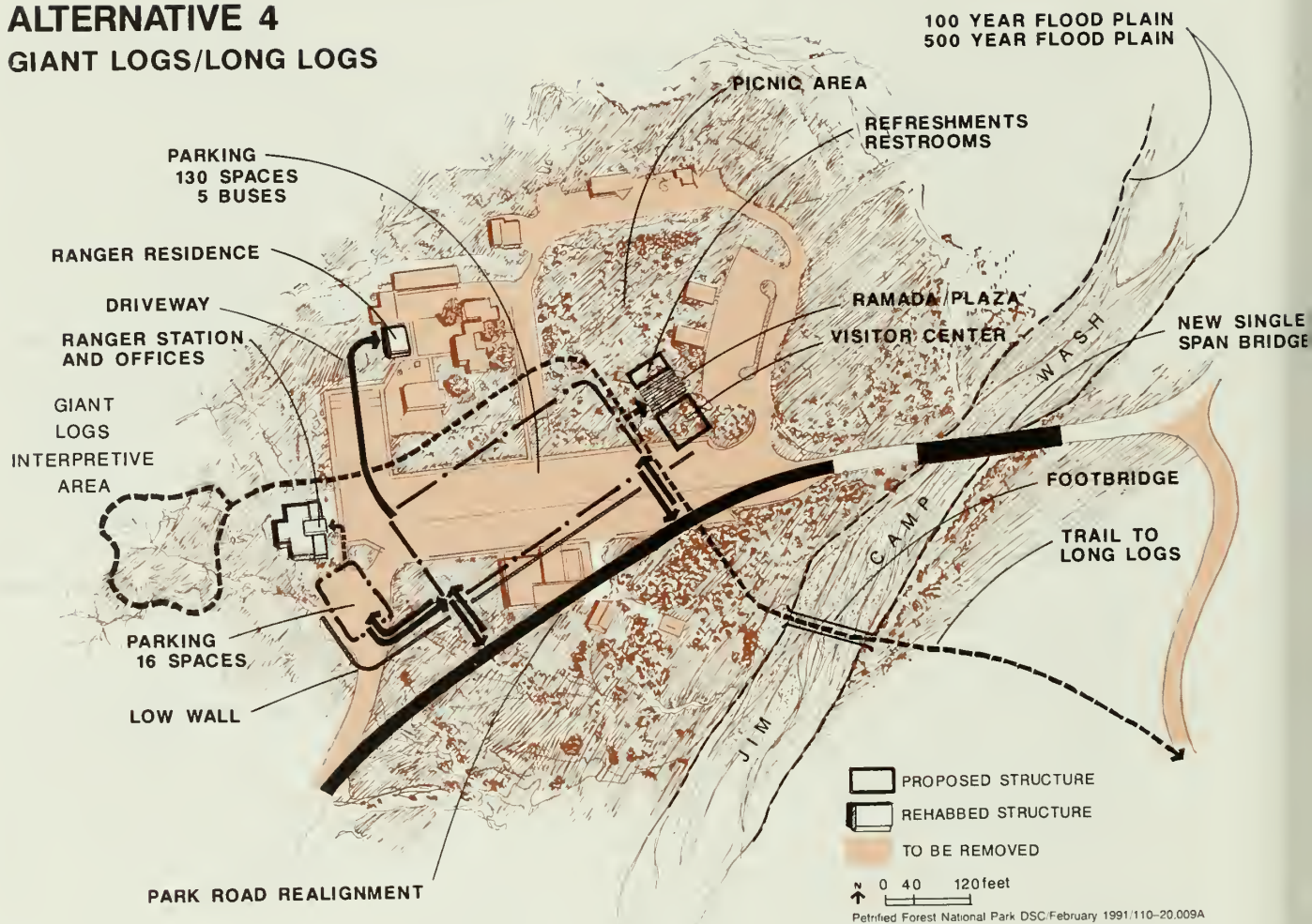
The existing concession building, maintenance buildings, and most of the housing would be removed, and their sites would be restored to natural conditions. Replacement facilities would be provided on the mesa top northwest of Giant Logs, the same as in alternative 2. A single residence would be retained at Giant Logs to provide on-site resource protection and emergency visitor services. The original chief ranger's house would be retained for this purpose. It is the best example of the historic architecture in this part of the park, and it would be rehabilitated on the exterior to return it to its appearance in the 1930s. The newest existing residence does not meet the safe standard for radon in the basement and would be removed along with the other, older buildings.

The existing visitor center/ranger station would be retained and renovated to provide the needed office space. The wing at the back of the ranger station would be given a new facade to make that later addition more compatible with the original structure. The interpretive trail through the Giant Logs behind the ranger station would be redesigned to improve its interpretive potential.

Once the existing concession building was removed, the main park road would be realigned to straighten an unsafe curve and to remove the thoroughfare from the middle of the parking lot. Once the road was realigned, the parking lot would be reconstructed on the north side of the road, adjacent to the new visitor center, so that visitors would no longer have to walk across the main park road to get to their cars. The existing box culvert bridge over Jim Camp Wash, which is causing an unnatural constriction to floodwaters and could

ALTERNATIVE 4

GIANT LOGS/LONG LOGS



potentially result in flooding of the developed area, would be replaced with a single-span concrete bridge to correct that problem. The segment of old-US 180 west of the main park road would be rehabilitated for access to the new maintenance facility. The 1.5-mile-long segment east of the main park road, which serves no purpose and is a visual intrusion on the view from Long Logs, would be obliterated. This would require the removal of two small bridges.

As in the other alternatives, the sewage lagoons would be floodproofed.

Alternatives Considered But Rejected

Provide Overnight Accommodations in the Park

The possibility of developing park overnight accommodations (a lodge, restaurant, recreation vehicle park, campground, and store) was studied by the superintendent and the concessioner in the fall of 1988. The study showed that the demand for overnight accommodations is being met by local enterprise in Holbrook and that these facilities would not be appropriate or economically feasible in the park (Kemper Consultants 1989).

Provide an Off-Site Administrative Complex at Holbrook

The option of an off-site administrative and maintenance area in Holbrook was considered as a means of removing park operations that could be conducted outside the park, thus reducing the environmental and visual impacts of development. This option was rejected for several reasons. The initial development costs of replacing a large proportion of the park's administrative and maintenance facilities with new structures in Holbrook would be similar to costs of new construction in the park. However, operational costs would be increased by the need to maintain three widely separated building

compounds (the main facility at Holbrook and required support facilities at the north and south ends of the park). Increased maintenance needs would require additional wage-grade positions and clerical support staff. It was estimated that annual mileage on administrative vehicles would double and that mileage on many maintenance vehicles would triple as a result of commuting between work stations in Holbrook and the park.

Provide Employee Housing in Holbrook

As described in the "Background" to the housing proposal, having employees find housing on the open market in Holbrook would be an economic hardship on employees and was never considered a viable alternative for the general management plan. During an earlier stage of planning, however, it looked like an option might exist for the National Park Service to purchase an excess federal housing complex in Holbrook and to provide housing for some employees there, rather than build a new housing area on the mesa top northwest of Giant Logs. This option was subsequently determined to be infeasible because of events that were occurring half a world away.

As part of the troop demobilizations prior to Desert Storm, Detachment 2 of the 1st Electronic Combat Range Group, Strategic Air Command, United States Air Force, based in Holbrook, was slated for a base closure in late 1991. The base had just built its own housing facility in Holbrook and had contracted for an expansion. The park superintendent and the planning team captain met with the base commander, toured the new housing, and began exploring the possibility of the National Park Service purchasing the Air Force housing, precluding the necessity of building that much more new housing inside the park.

Now, in the aftermath of Desert Storm, the complement of troops in Detachment 2 has been slated for such an increase that the Air Force plans on using all of its housing in

Holbrook and is looking into rental contracts for housing on the open marking, which would make adequate housing for park employees even harder to find than it has been in the past.

Boundary Expansion Discussed in the 1987 *Statement for Management*

Appendix D of the 1987 *Statement For Management* contains a memorandum from the resource management specialist to the chief ranger regarding possible additions to Petrified Forest National Park. The memo states that "this report does not represent a formal proposal, but rather, a preliminary inventory....primarily a map exercise." The focus in 1987 was on lands immediately adjacent to the park boundaries that included the natural extensions of geographic features contained within the park. The primary concern was to protect important viewsheds wherever that would be possible with a relatively minor boundary adjustment. Nine parcels of adjacent lands were felt to meet these criteria. The report concluded: "Although all of these parcels would still leave

the park with mostly straight lines for boundaries, these lines are more closely adjusted to the features the park was set aside to protect. These parcels are approximations only, since the areas should be visited and studied closely before any formal proposals are based on them. At that time, boundaries following the desired resources more closely can be drawn."

Since the 1987 *Statement for Management* the general management planning process has identified the need to reorient visitor use and resource management to focus on the park's globally and nationally significant paleontological and archeological resources. Because the boundary adjustments discussed in the *Statement for Management* would leave approximately half of the globally significant Chinle formation outside the park, and because threats to the paleontological resources contained within the Chinle are increasing (see the "Background" section for the boundary proposal), the boundary adjustments considered in 1987 are not considered a viable alternative for the general management plan.

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TABLE 10: SUMMARY COMPARISON OF ALTERNATIVES

LOCATION	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PROPOSAL	ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
Headquarters	retain visitor contact station (1,500 sq ft)	(See Tiponi Point)	replace/expand visitor center (11,000 sq ft)	same as alternative 2
	no research center	(See Tiponi Point)	construct research center (8,000 sq ft)	same as alternative 2
	retain concession food service and gift shop (6,000 sq ft)	(See Tiponi Point)	rehab concession food service and gift shop (6,000 sq ft)	same as alternative 2
	retain administrative offices (5,500 sq ft)	replace/expand administrative offices (10,000 sq ft)	same as alternative 2	same as alternative 2
	retain maintenance facilities (13,000 sq ft)	replace/expand maintenance facilities (29,000 sq ft)	same as alternative 2	same as alternative 2
	retain employee community facilities (4,000 sq ft)	replace employee community facilities (4,000 sq ft)	same as alternative 2	same as alternative 2
	retain NPS housing (18 three-bedroom residences and 10 apartments)	replace/expand NPS housing (11 three-bedroom and 10 two-bedroom residences, 10 apartments, 10-room dormitory)	same as alternative 2	same as alternative 2
	retain concessioner housing	replace/expand concessioner housing (1 three-bedroom and 1 two-bedroom residence, 8 two-bedroom apartments)	same as alternative 2	same as alternative 2
	retain park road	realign park road	same as alternative 1	same as alternative 2
	retain gas station	relocate gas station	same as alternative 2	same as alternative 2
	retain entrance station	relocate entrance station	same as alternative 2	same as alternative 2
	retain sewage ponds	add new cell to sewage ponds	same as alternative 2	same as alternative 2

LOCATION	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PROPOSAL	ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
Tiponi Point		construct visitor center (11,000 sq ft)		same as alternative 2
		construct research center (8,000 sq ft)		same as alternative 2
		construct concessioner cafeteria and gift shop		same as alternative 2
		construct short trail to floor of Painted Desert and construct 3-mile loop trail to Kachina Point		same as alternative 2
Kachina Point	retain parking pulloff	remove parking pulloff, integrate with rim viewing esplanade	same as alternative 1	same as alternative 2
	preserve but do not use the Painted Desert Inn	adaptively use the Painted Desert Inn for scenic viewing, interpretation, cultural demonstrations, and cooperating association sales	same as alternative 2	same as alternative 2
	retain trail to floor of Painted Desert	rehabilitate trail to floor of Painted Desert	same as alternative 2	same as alternative 2
Chinde Point	retain picnic area at back of site	construct 24-table picnic area near the rim	same as alternative 2	same as alternative 2
	retain restrooms	construct restrooms	same as alternative 2	same as alternative 2
	retain parking pulloffs and interpretive wayside exhibits	construct loop nature trail same as alternative 1	same as alternative 2 same as alternative 1	same as alternative 2 same as alternative 1
Tawa, Pintado, Nizhoni, Whipple, and Lacey Points				
Puerco Valley Viewpoint		construct parking pulloff and install interpretive wayside exhibit	same as alternative 2	same as alternative 2
Puerco Ruins	retain parking lot	same as alternative 1	same as alternative 1	same as alternative 1
	retain restrooms	same as alternative 1	same as alternative 1	same as alternative 1

LOCATION	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PROPOSAL	ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
Puerco Ruins, cont'd		convert stone building to visitor contact station	same as alternative 2	same as alternative 2
		install wayside exhibit interpreting the railroad	same as alternative 2	same as alternative 2
Newspaper Rock	retain parking lot	same as alternative 1	same as alternative 1	same as alternative 1
	retain viewing devices	replace viewing devices and provide a new wayside exhibit	same as alternative 2	same as alternative 2
Tepees	retain wayside exhibit (now in preparation)	same as alternative 1	same as alternative 1	same as alternative 1
	retain parking	expand parking (20 cars)	same as alternative 2	same as alternative 2
		construct 1.5-mile trail to Blue Mesa	same as alternative 2	same as alternative 2
Blue Mesa	retain trailhead parking (9 cars) and trail to floor of badlands	same as alternative 1	same as alternative 1	same as alternative 1
		construct picnic area (four to six single tables and two groups of two tables)	same as alternative 2	same as alternative 2
		construct restrooms (composting toilets)	same as alternative 2	same as alternative 2
		construct parking lot (10 cars) and connector trail	same as alternative 2	same as alternative 2
Agate Bridge	retain parking lot	same as alternative 1	same as alternative 1	same as alternative 1
	retain wayside exhibit	install new wayside exhibit	same as alternative 2	same as alternative 2
	retain comfort station	same as alternative 1	same as alternative 1	same as alternative 1
		construct 1/8-mile barrier-free loop trail	same as alternative 2	same as alternative 2
Jasper Forest	retain parking pulloff and wayside exhibit (now in preparation)	same as alternative 1	same as alternative 1	same as alternative 1

LOCATION	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PROPOSAL	ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
Crystal Forest	retain parking lot and wayside exhibit (now in preparation)	same as alternative 1	same as alternative 1	same as alternative 1
The Flattops	retain parking pulloff and trail to Flattops	remove parking pulloff and trail to Flattops	same as alternative 2	same as alternative 2
Giant Logs/Long Logs	retain visitor center (3,000 sq ft)	adapt existing structure for enlarged visitor center (4,200 sq ft)	adapt existing structure for enlarged visitor center (4,200 sq ft)	construct visitor center (3,500 sq ft)
	retain trail through Giant Logs	construct new trail through Giant Logs	same as alternative 2	same as alternative 2
	retain access road, parking lot, and trail at Long Logs	remove road to Long Logs and remove Long Logs parking lot; construct 1-mile barrier-free trail from visitor center to join existing trail at Long Logs	same as alternative 1	same as alternative 2
	retain snack bar (1,000 sq ft)	adapt existing structure for snack bar (400 sq ft)	install vending machines	construct small snack bar (400 sq ft)
	retain picnic area	construct ramada/plaza (1,500 sq ft)	construct ramada (300 sq ft)	same as alternative 2
	retain ranger station (700 sq ft)	same as alternative 1	relocate picnic area	same as alternative 3
	retain NPS housing (6 two- bedroom, 1 one-bedroom, and 1 one-room units)	adapt existing structure for ranger station (2,200 sq ft)	construct ranger station (3,000 sq ft)	adapt existing structure for enlarged ranger station (4,200 sq ft)
	retain maintenance facilities (2,500 sq ft)	retain one residence, replace remainder of housing on mesa behind Giant Logs (2 three-bedroom and 2 two- bedroom residences and 9 apartments)	infill NPS housing (add 2 two-bedroom and 2 three- bedroom residences)	same as alternative 2
		replace maintenance facilities on mesa behind Giant Logs (5,000 sq ft)	retain maintenance facilities, add 2,500-sq ft structure	same as alternative 2

LOCATION	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2: PROPOSAL	ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
Giant Logs/Long Logs, cont'd	retain parking lot	relocate parking lot	same as alternative 2	same as alternative 2
	retain road	realign road	same as alternative 2	same as alternative 2
	retain bridge	same as alternative 1	same as alternative 1	replace bridge
	retain sewage ponds	floodproof sewage ponds	same as alternative 2	same as alternative 2
Parkwide Utilities	connect to Navajo Tribal Utility Authority water; retain well number two as backup water source	same as alternative 1	same as alternative 1	same as alternative 1
	retain power and telephone lines	bury power and telephone lines and remove unused lines	same as alternative 2	same as alternative 2

TABLE 11: ESTIMATED CONSTRUCTION COSTS, ALTERNATIVES 2-4

	ALTERNATIVE 2: PROPOSAL	ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
NATIONAL PARK SERVICE COSTS			
Painted Desert Area			
Visitor center	\$ 4,421,000	\$ 5,253,000	\$ 4,421,000
Interpretive media	327,000	366,000	327,000
Research center	3,075,000	3,655,000	3,075,000
Trails	191,000	0	191,000
Administrative offices	2,594,000	2,802,000	2,594,000
Maintenance facilities	6,410,000	6,925,000	6,410,000
Employee housing	3,720,000	3,720,000	3,720,000
Employee/community bldg.	615,000	664,000	615,000
Utilities	516,000	353,000	516,000
Roads	845,000	0	845,000
Road removal/restoration	198,000	0	198,000
Parking	420,000	103,000	420,000
Area Subtotals	\$23,332,000	\$23,841,000	\$23,332,000
Road Corridor Sites			
Painted Desert Inn	\$ 2,306,000	\$ 2,306,000	\$ 2,306,000
Interpretive media	170,000	170,000	170,000
Picnic areas	135,000	135,000	135,000
Trails	79,000	79,000	79,000
Restrooms	288,000	288,000	288,000
Parking	62,000	62,000	62,000
Area Subtotals	\$ 3,040,000	\$ 3,040,000	\$ 3,040,000
Giant Logs/Long Logs Area			
Visitor center	\$ 403,000	\$ 403,000	\$ 1,183,000
Interpretive media	236,000	236,000	236,000
Ramada/plaza	92,000	7,000	144,000
Restrooms	229,000	327,000	308,000
Snack bar	73,000	0	116,000
Vending	0	4,000	0
Gift shop	91,000	0	0
Ranger station	409,000	547,000	202,000
Picnic area	19,000	38,000	38,000
Trails	88,000	48,000	88,000
Trail bridge	131,000	0	131,000
Maintenance facilities	1,056,000	528,000	1,056,000

	ALTERNATIVE 2: PROPOSAL	ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
Employee housing (new)	11,423,000	606,000	11,423,000
Employee housing (rehab existing)	0	346,000	0
Utility lines	1,102,000	0	1,102,000
Land restoration	144,000	126,000	370,000
Old US 180 removal	587,000	587,000	587,000
Roads	266,000	266,000	266,000
Bridge replacement	0	0	1,467,000
Parking	343,000	478,000	409,000
Road/parking removal	169,000	211,000	352,000
Area Subtotals	<u>\$ 16,861,000</u>	<u>\$ 4,758,000</u>	<u>\$ 19,478,000</u>
Total Gross Construction Costs*	<u>\$43,233,000</u>	<u>\$31,639,000</u>	<u>\$45,850,000</u>
Planning and Design	<u>8,251,000</u>	<u>6,038,000</u>	<u>8,750,000</u>
Grand Total	<u>\$51,484,000</u>	<u>\$37,677,000</u>	<u>\$54,600,000</u>
CONCESSIONER COSTS			
Painted Desert Area			
Gift shop/cafeteria	\$ 1,006,000	\$ 147,000	\$ 1,006,000
Gas station/food mart	455,000	455,000	455,000
Employee housing	<u>791,000</u>	<u>791,000</u>	<u>791,000</u>
Area Subtotals	<u>\$ 2,252,000</u>	<u>\$ 1,393,000</u>	<u>\$ 2,252,000</u>
Giant Logs Area			
Employee housing	\$ 314,400	\$ 0	\$ 314,000
Area Subtotal	<u>\$ 314,400</u>	<u>\$ 0</u>	<u>\$ 314,000</u>
Total Costs**	<u>\$ 2,566,400</u>	<u>\$ 1,393,000</u>	<u>\$ 2,566,000</u>

*Includes construction costs plus construction supervision and contingencies.

**Includes all planning, design, and construction costs. NPS policy requires that, to the extent it is economically feasible, the concessioner undertake all costs relating to construction of its own facilities as well as utilities, roads, parking, and similar infrastructure. Such feasibility determination has not yet been made, but will be accomplished prior to implementation of this plan. The cost allocation above must therefore be regarded as tentative.

TABLE 12: SUMMARY COMPARISON OF IMPACTS

	ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2 (PROPOSAL):	ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
NATURAL RESOURCES				
Paleontological Resources	ongoing depletion of petrified wood chips throughout the park and especially at Long Logs research designed to achieve private institutional goals; fossils preserved in various collections in scattered locations more than half of the Chinle outcrop unprotected	substantially decreased potential for depletion of petrified wood chips throughout the park and especially at Long Logs research designed to achieve public resource management goals; fossils preserved in park collection, facilitating comparative studies all of the Chinle outcrop protected inside the park boundary	decreased potential for depletion of petrified wood chips throughout the park same as alternative 2 same as alternative 2	same as alternative 2 same as alternative 2
Land Disturbance/ Revegetation	ongoing disturbance of 30 acres of desert shrub at headquarters ongoing disturbance of small areas around all the pulloffs	ongoing disturbance of 28 acres and new disturbance of about 3 acres of desert shrub at headquarters new disturbance of about 16 acres of desert shrub at Tiponi Point revegetation of disturbed areas around the pulloffs new disturbance of 0.5 acre of shortgrass prairie vegetation at Blue Mesa restoration of 0.5 acre of shortgrass prairie at Agate Bridge	ongoing disturbance of 30 acres and new disturbance of about 3 acres of desert shrub at headquarters; no new disturbance at Tiponi Point same as alternative 2	same as alternative 2 same as alternative 2

ALTERNATIVE 1: NO ACTION	ALTERNATIVE 2 (PROPOSAL):	ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
Land Disturbance/ Revegetation, cont'd	ongoing disturbance of 8.2 acres of desert shrub at Giant Logs	ongoing disturbance of 8.2 acres and new disturbance of about 0.5 acre of desert shrub at Giant Logs	ongoing disturbance of 1.3 acre of desert shrub at Giant Logs
	new disturbance of about 6 acres of shortgrass prairie on the mesa northwest of Giant Logs	same as alternative 2	same as alternative 2
	potential for additional areas of shortgrass prairie to recover from the effects of overgrazing if boundary changed and livestock grazing phased out	same as alternative 2	same as alternative 2
Wilderness Values	use managed to ensure preservation of naturalness and solitude	same as alternative 2	same as alternative 2
	potential for eventual degradation of wilderness values in the narrow neck of the Rainbow Forest wilderness	same as alternative 2	same as alternative 2
Viewshed	gradual encroachment of roads, residential structures, mining scars, and other incompatible features into expansive vistas	same as alternative 2	same as alternative 2

ALTERNATIVE 1: NO ACTION		ALTERNATIVE 2 (PROPOSAL):		ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
CULTURAL RESOURCES	Archeological Sites	no new disturbance	potential for new disturbance at headquarters site, Tiponi Point, Puerco Valley overlook, Blue Mesa, and Giant Logs	potential for new disturbance at headquarters site, Puerco Valley overlook, Blue Mesa, and Giant Logs	same as alternative 2
		ongoing disturbance of Flattops site	reduced potential for disturbance of Flattops site	same as alternative 2	same as alternative 2
		significant resources adjacent to the park threatened by pot hunting and incompatible development	additional significant resources included in the park and protected from pot hunting and incompatible development	same as alternative 2	same as alternative 2
	Historic Structures	preservation of the Painted Desert Inn	preservation and adaptive use of the Painted Desert Inn, increasing its priority for long-term maintenance	same as alternative 2	same as alternative 2
		preservation of 1930s development complex at Giant Logs, which could potentially be rehabilitated at some time in the future to make it eligible for the National Register of Historic Places; continued use as housing would make historic rehabilitation unlikely	rehabilitation of 1930s development complex at Giant Logs to restore significant historic values	similar to alternative 1 but infill housing and expansion of maintenance area would reduce potential for register eligibility	loss of buildings at Giant Logs that could potentially be rehabilitated to make them eligible for the register
VISITOR EXPERIENCE AND SAFETY					
	Arrival Experience	poor sense of arrival: no tie to resources at north end; tied to altered Giant Logs area at south end	enhanced sense of arrival: tied to Painted Desert at north end and natural-appearing Long Logs at south end	same as alternative 1	same as alternative 2

ALTERNATIVE 1: NO ACTION		ALTERNATIVE 2 (PROPOSAL):		ALTERNATIVE 3: MINIMUM REQUIREMENTS	ALTERNATIVE 4: REDUCE DEVELOPMENT AT GIANT LOGS
Resource Appreciation/ Understanding	limited opportunities to understand relationships among resources	greatly expanded opportunities to understand relationships among resources	same as alternative 2	same as alternative 2	same as alternative 2
	no opportunity to go inside the Painted Desert Inn; no visitor programs	opportunity for visitor programs inside the Painted Desert Inn	same as alternative 2	same as alternative 2	same as alternative 2
Recreation	limited hiking opportunities	expanded hiking opportunities in Painted Desert and Rainbow Forest areas	expanded hiking opportunities in Rainbow Forest area	same as alternative 2	same as alternative 2
Flood-Hazard Concerns	sewage ponds, bridge, part of parking lot, short section of roadway, store, and concessioner housing at Giant Logs in the floodplain (sewage ponds would be floodproofed)	same as alternative 1 except store and concessioner housing removed	same as alternative 2	sewage ponds at Giant Logs in the floodplain (would be floodproofed)	
ECONOMIC IMPACTS					
Regional tourism	no effect	potential benefit to regional tourism economy associated with longer visitor stays in the park	same as alternative 2	same as alternative 2	
Existing Landowners	no effect on adjacent landowners	phase-out of livestock grazing as the existing source of income on 97,800 acres, approximately 55 percent of which is in private ownership (nine individual owners) and 45 percent in leased allotments on public lands	same as alternative 2	same as alternative 2	

Environmental Consequences

Alternative 1: No Action

Impacts on Natural Resources

Paleontological Resources. People would continue to drive to the edge of the Long Logs wood site, which would make it easier for them to transport and conceal stolen wood. The rate of depletion of petrified wood has not been uniformly established, but test plots at Blue Mesa in the summer of 1988 indicated that 20 percent of the marked wood was taken in a two-week period. If no action was taken to mitigate this problem, portions of the Long Logs area and other petrified wood sites close to the road might eventually be depleted of petrified wood chips like the Crystal Forest area is today.

The perpetuation of the existing research and management strategy would ensure the long-term preservation of the fossils removed from the park. However, the fossils would continue to be scattered in the collections of various research institutions and would not be easily accessible as a group for comparative studies. Also, the return of information to the National Park Service and the public would remain sporadic.

If no action was taken to change the boundaries of Petrified Forest National Park to protect adjacent related resources, the Triassic period might never be understood as well as it might otherwise have been. The globally significant fossil remains of the late Triassic within the park represent only 25 to 30 percent of the total length of the exposed fossil-bearing Chinle formation in the Petrified Forest area. The National Park Service would continue to manage its fossil resources in the park, but the potential to discover more of the Triassic story in what are considered even better research areas outside the park would never be realized. In the absence of a systematic program of exploration, excavation, and research outside the existing park boundary, skeletal remains would continue to disintegrate as they eroded out of the Chinle. Petrified wood would be depleted by legal commercial mining and theft. Mineral exploration,

building construction, waste dump operations, and other land-disturbing activities would be expected to become more prevalent and would destroy paleontological resources.

Land Disturbance/Revegetation. Approximately 29.5 acres of mixed desert shrub would remain disturbed by existing administrative, maintenance, residential, and visitor facilities in the headquarters area.

An estimated 8.2 acres of desert shrub would continue to be disturbed at Giant Logs.

Small sites would be disturbed by pavement and foot traffic at all the pulloffs along the park road. The lack of formalized trails at some locations, such as Agate Bridge, compounded by the absence of vegetation management, would perpetuate adverse impacts on the native species composition in the immediate vicinities of some of the pulloffs.

If no action was taken, Chinde Point would continue to recover slowly from the disturbance caused by the previous quarry operation.

The possible development of a large landfill east of the park boundary in Ninemile Wash would introduce a major source of fugitive dust and possibly of other pollutants associated with emissions from incineration and contamination of surface or groundwater sources. It would also introduce alien species of plants and animals into the shortgrass prairie ecosystem.

Wilderness. The existing wilderness values of the narrow neck of the Rainbow Forest wilderness area could potentially be degraded by incompatible land uses outside the park boundary. The wilderness would remain only 600 yards wide near the Flattops. The potential for eventual development on the adjacent private land would be high, and any development would be visible from the wilderness. Depending on the nature of the development, it might also introduce air or water pollutants or alien species into the wilderness.

Scenic Vistas. The expansive vistas enjoyed by park visitors could potentially be degraded by scattered residential structures and possibly a large waste dump and other commercial facilities. The viewsheds for these vistas would continue to include a considerable amount of private land that has remained natural-looking until now because the traditional use has been livestock grazing and only small improvements, like corrals, earthen dams, and barbed-wire fences, have been built on the land. This pattern of use is now changing, and the assumption that the viewsheds would remain protected is not valid. If no action was taken to protect the vistas seen from the park, 40-acre ranchettes with double-wide mobile homes would become increasingly prominent on the landscape. The proposed landfill site would seriously degrade the expansive views to the east of the park, especially the views from major overlooks like Blue Mesa and Agate Bridge.

Housing and maintenance facilities would continue to intrude on the natural settings of Giant Logs and Long Logs, which are two of the park's major points of interest. The need to periodically expand and improve facilities to adequately meet employees' needs for housing would make this development an even more imposing feature on the landscape in the future.

Impacts on Cultural Resources

The preservation-maintenance of the Painted Desert Inn would continue; however, the building would remain unused, and this would reduce its priority for long-term maintenance funding, thus potentially resulting in further deterioration.

The entire 1930s development complex at Giant Logs would be maintained and used. With no action taken to rehabilitate the structures, they would remain ineligible for the National Register of Historic Places.

The Flattops archeological site would continue to be affected by foot traffic and probably by removal of artifacts. Social trails would proliferate, becoming more visible from the road. Foot traffic around the ruins and the removal of small artifacts would cause further degradation of

the site, seriously threatening its archeological integrity. There would be no potential for further impacts on other known archeological sites in the park.

If the park was not expanded to protect adjacent significant archeological sites, the archeological history of the Petrified Forest area would never be as well researched and preserved as it could be with the proposed additions. The division of a number of related archeological sites by the existing park boundary has been documented by the recent boundary survey (NPS 1989a). The same proposed actions that threaten the paleontological resources outside the park also threaten the archeological sites. Pot-hunting along the border of the park would continue to destroy nationally significant values.

Impacts on Visitor Experience and Safety

Visitor Experience. The visitor contact station near the north entrance would remain inadequate and poorly located to provide visitors with a quality introductory experience. Many visitors would leave with little or no appreciation of the park's geologic, scenic, paleontological, and cultural resources and how they interrelate. Also, most visitors would not be aware of the opportunity to hike along the rim or to the floor of the Painted Desert.

People would not have the opportunity of go inside the historic Painted Desert Inn.

The poor quality of the existing viewing devices at Newspaper Rock would make it difficult for visitors to see the petroglyphs, and some people would be disappointed by the lack of opportunity to experience these famous resources.

At Giant Logs, the existing concession building would continue to dominate the developed area, attracting visitors' attention. Many visitors would continue to stop at the concession for information and other services and would fail to have any contact with the National Park Service at the south end of the park. The Giant Logs visitor center would remain too small and out of date to adequately introduce visitors to the park and its resources. As a result, many visitors would

continue to drive quickly through the park without experiencing any of the excitement of discovery or adventure the park has to offer. Visitors who did stop at the center would have to walk through a dangerously designed parking lot/road corridor to get from their cars to the building.

The juxtaposition of visitor facilities and employee housing at Giant Logs would continue to degrade the aesthetic appeal of the area for visitors and also infringe on the privacy of employees.

Visitors' attention would remain focused on Giant Logs, where the petrified wood is presented in the context of museum exhibits rather than in a natural context. For many visitors (especially those who would not walk through Long Logs or the other more natural sites) that would be their lasting impression of the resource. Visitors could continue to drive their cars to Long Logs, giving all visitors the opportunity to see that resource. For visitors with the time and interest to leave their cars and visit a more remote, secluded wood site, the opportunity would not be available.

Flood Hazard. The sewage ponds at Giant Logs would remain in the floodplain of Jim Camp Wash. The ponds would have to be floodproofed in compliance with NPS guidelines to avoid the threat of surface- and groundwater contamination in the event of major flooding. The concessioner's store and housing, the picnic area, and both parking lots would remain in the 500-year floodplain. The road bridge and a short section of the park road would remain in the 100-year floodplain; both of these are excepted facilities under NPS "Floodplain Management and Wetland Protection Guidelines" (*Federal Register* 45:35916 and 47:36718).

Economic Impacts

There would be no impacts on park concessioners, adjacent landowners, or regional businesses and residents.

Alternative 2: Proposal

Impacts on Natural Resources

Paleontological Resources—*Existing Boundary.* Petrified wood theft would be expected to decrease as a result of improved interpretation, education, and patrol efforts throughout the park. Closing Long Logs to vehicle access and making it a walk-in site would help deter wood theft, preserving more of the wood resources for enjoyment of future generations. Large sections of wood would be avoided in siting the new trail to Long Logs and in redesigning the Giant Logs trail.

An NPS research center would help direct and support the systematic study of the Chinle formation where it is exposed inside the park. An on-site research center would also provide the opportunity for comparative studies of the park's paleontological collection, which would greatly facilitate research into the park's Triassic environment, contributing valuable information to the resource management and interpretive programs.

—*Proposed Boundary.* The proposed boundary change would allow for the extension of scientific study throughout the Chinle escarpment exposed in this area. The exposures inside the current park boundary are considered the model for late Triassic sedimentation in the Southwest and are used by scientists worldwide as a standard. However, because of erosion, structural downwarping, and abrupt pinchouts of some marker beds, it has been difficult at best to reconstruct the physical environments of deposition (Billingsley 1985 and Middleton, appendix C). The portions of the Chinle formation outside the current park boundary are more continuous, and some of the exposures are superior to any inside the park; consequently, research in these areas would be expected to fill major gaps in the existing data base.

From the point of view of one of the researchers who has worked in this area (see Middleton, appendix C), the lateral continuity of the outcrops east of the current boundary would afford a unique opportunity to do detailed profiling of the geometries of Triassic fluvial complexes, leading

to the academic reconstruction of the sizes, types, and evolution of the drainage networks that existed during the late Triassic in northeastern Arizona. This would result in considerable refinement of concepts of the climatic and geographic evolution of the area. The portions of the Chinle escarpment outside the current boundary would also be expected to yield as much, if not more, fossil material than the exposures in the park, contributing significantly to the understanding of the paleoecology of the Triassic period.

Species of Special Concern—Existing Boundary. A 1988 survey did not find any gladiator milk vetch at the site of the proposed picnic area on Blue Mesa. A preconstruction survey would be conducted at the appropriate time of year to ensure that construction activity did not affect the species. If a potential for effect was identified, mitigating measures would be developed in consultation with the U.S. Fish and Wildlife Service. Vegetation restoration at Agate Bridge would help protect potential habitat for gladiator milk vetch at that location. The rare plant might recolonize the revegetated area, thus increasing its population.

No development would occur in the known habitat of the paper-spined cactus.

—*Proposed Boundary.* If Congress expanded the park boundary, surveys for gladiator milk vetch and paper-spined cactus would be conducted in the new additions. The proposed boundary adjustment would include two known populations of gladiator milk vetch (both on the west rim of the Painted Desert) and hundreds of acres of additional potential habitat for both of these rare species inside the park boundary.

Land Disturbance/Revegetation—Existing Boundary. Approximately 16 additional acres of mixed desert shrub vegetation would be disturbed by construction of visitor facilities and a research center near Tiponi Point. Reconstructing and expanding headquarters at the existing site would disturb approximately 2 additional acres of mixed desert shrub vegetation around the periphery of the existing development site. Less than 1 acre of desert shrub would be disturbed by construction of a new gas station.

Approximately 2 acres of existing roadway would be revegetated. In analyzing the cumulative effects of the proposal, it should be noted that an acre of revegetated land would not equal the natural diversity or ecological integrity of an acre of previously undisturbed land. The arid climate, poor soils, and other factors would severely limit the recovery potential of these lands. The data do not exist to accurately estimate the recovery period or to describe the ecological differences between undisturbed and previously disturbed/revegetated sites. New construction might affect populations of Gunnison's prairie dogs living in the area, either directly through destruction of their towns or indirectly through destruction and disturbance of forage areas. Individual prairie dogs would be captured and relocated to suitable new habitat before a town was destroyed, and no long-term change in population levels would be expected. Construction of a new cell at the sewage ponds would increase stopover habitat for migratory shorebirds and waterfowl.

Construction of the trail from Tiponi Point to Kachina Point would follow existing trail alignments for most of the way, which would minimize new land disturbance.

Chinde Point would be recontoured and revegetated with native species, thus hastening the recovery of the natural vegetation.

Approximately 0.5 acre of shortgrass prairie vegetation and scattered petrified wood would be disturbed for construction of the picnic area and parking lot on Blue Mesa.

The elimination of social trails and site revegetation would restore approximately 0.5 acre of native grassland at Agate Bridge.

Portions of a sandy knoll and about 200 yards of abandoned trail at the Flattops would be revegetated with native grasses.

Approximately 7.8 acres of mixed desert shrub would remain impacted near Giant Logs, and approximately 6 acres of shortgrass prairie would be disturbed on the mesa top.

—*Proposed Boundary.* If Congress expanded the park boundary and if cattle grazing was phased

out of the proposed additions, a shortgrass prairie ecosystem would slowly recover on thousands of acres. Riparian areas would be restored. The density of vegetation in the shortgrass prairie and mixed desert shrub communities would increase over time, providing better habitat, which would allow for local increases in animal populations. The existing park program to eradicate and control tamarisk would be extended to the new additions, concentrating on restoration of areas most critical to wildlife, such as Ninemile Seep and the lower reaches of Ninemile Wash and Dead Wash.

The park's pronghorn herd would be expected to reach more natural population levels and distribution if it did not have to compete for habitat with domestic livestock. The herd's habitat requirements and population dynamics could be more accurately studied if more of its natural range was included within the park boundary.

The preclusion of a large waste dump in Ninemile Wash would eliminate possibilities of fugitive dust and other pollutants contaminating the park's air and water resources and the possibility of alien plant and animal species being introduced into the shortgrass prairie ecosystem.

Wilderness—Existing Boundary. No new facilities or trails would be visible from the Painted Desert wilderness. Visitors would continue to have access to that wilderness unit by way of a trail from Kachina Point and also by a new trail from Tiponi Point. Only a very small percentage of visitors currently enter the wilderness, and this use would be expected to increase once visitors became more aware of and interested in the opportunities for hiking and sightseeing in this part of the park.

Long Logs would become the primary entrance to the Rainbow Forest wilderness. There would no longer be access to the Rainbow Forest wilderness from the Flattops. Use of this wilderness unit would be expected to increase as visitors were encouraged to explore more of the park and to witness the resources on site. An emphasis on personal services, such as guided hikes, in this part of the park would help ensure

that visitors' activities were compatible with the preservation of wilderness values.

The park staff would continue to monitor wilderness use and would identify and take appropriate management actions if use levels ever threatened wilderness values such as naturalness or solitude.

The removal of the abandoned section of old US 180 and the revegetation of the corridor might qualify this area for addition to wilderness, thereby increasing the protection for the viewshed and bone beds south of Long Logs.

—*Proposed Boundary.* Any areas added to the park that appeared to have wilderness values would be studied to determine their suitability and feasibility for wilderness designation. This might result in the expansion of the Painted Desert or Rainbow Forest wilderness units and the long-term preservation of wilderness values such as naturalness and solitude in these areas.

If the Wallace tank parcel was added to the park and found to be suitable and feasible for wilderness, its inclusion by Congress in the national wilderness preservation system would help protect the naturalness and solitude of the existing Rainbow Forest wilderness, which is narrow and highly vulnerable to intrusions in this part of the park.

Scenic Vistas—Existing Boundary. The new structures near Tiponi Point would be set back far enough from the rim to avoid a visual intrusion on the Painted Desert.

Visitor facilities would remain as visual intrusions on the outstanding natural resources at Giant Logs and Long Logs.

—*Proposed Boundary.* If Congress expanded the park boundary, the inclusion of the proposed additions would protect a number of significant viewsheds. As open space and uncluttered vistas became more rare in this country, and in the world for that matter, the immense vistas visible from overlooks in the park would become increasingly valuable for allowing future generations to see, enjoy, and understand what

the wide-open spaces of America's western frontier were really like.

Inclusion of the west Chinle escarpment would protect the view toward the west seen by visitors traveling south on the park road, including the distant high mesas that dominate the skyline in views from Blue Mesa and the Jasper Forest overlook. Inclusion of the east Chinle parcel would protect the expansive vistas seen from Blue Mesa, Agate Bridge, the Puerco ruins, and the park headquarters.

Including the west rim of the Painted Desert would protect the vistas from the Painted Desert rim drive looking west to the horizon. Inclusion of the Rainbow Forest badlands would protect the view along the southern approach to the park.

The inclusion of the Dead Wash petroglyphs would protect the views from the Puerco ruins along the southern reaches of Dead Wash. Inclusion of the Wallace tank parcel would protect views from Blue Mesa and Agate Bridge. Inclusion of the Canyon Butte parcel would protect the views of the highly visible sequence of dark mesas that appear to ride above the yellow prairie northwest of the Flattops.

Impacts on Cultural Resources

Archeological Resources—*Existing Boundary.* Prior to ground-disturbing activities at the headquarters site, Tiponi Point, the proposed site of the Puerco Valley overlook, Blue Mesa, Giant Logs, and the proposed housing and maintenance site on the mesa top northwest of Giant Logs, potential development locations would be intensively surveyed. Every effort would be made to implement the plan without disturbing cultural resources. If disturbance was unavoidable, mitigation procedures would be developed in consultation with the Arizona state historic preservation officer and the Advisory Council on Historic Preservation. The archeological site at the Flattops would be protected by removing the parking pulloff and reducing foot traffic in that vicinity.

—*Proposed Boundary.* The proposed boundary additions would ensure the long-term

preservation of hundreds of important archeological sites related to several prehistoric cultures. The proposed additions would include rare Archaic sites, some of the best and most unusual rock art panels in the Southwest, Basketmaker villages, pueblos, petrified wood quarries, and historic sites. Research at these sites would be expected to increase understanding of the trade networks that supported the flow of goods, people, and ideas throughout this frontier region in late prehistoric times and help fill the current gap in the chronology between the prehistoric and historic periods.

Historic Sites—*Existing Boundary.* The Painted Desert Inn National Historic Landmark would be rehabilitated for interpretation and visitor services, which would increase its priority for long-term maintenance funding and provide for its continued preservation. The uses proposed for the inn—interpretation of the scenic vistas of the Painted Desert, the history of the building, and the lifeways and arts of regional cultures—would be similar to its historic uses and recapture some of the original ambiance of the building. A state-of-the-art security system would be installed to protect the inn from trespass entry, vandalism, or fire.

All of the existing structures at Giant Logs except the concession building, the concessioner residence, the two maintenance buildings, and the newest NPS residence (not historic) would be retained and used. Buildings 51 and 52 would be rehabilitated to return them to their 1930s appearance by replacing the wooden casement windows, removing roofline intrusions, and other actions recommended by the state historic preservation officer and NPS historical architects. This action would preserve a unique assemblage of structures representing an era of commitment to conservation and a sensitivity to natural and cultural values.

—*Proposed Boundary.* No historic sites are known within the proposed boundary.

Impacts on Visitor Experience and Safety

Visitor Experience—*Existing Boundary.* Visitors' understanding of the history of life would be increased, which might promote a desire to live their own lives in better harmony with nature, an unquantifiable, but very real, contribution to the quality of life on this planet.

The new visitor center near Tiponi Point would introduce arriving visitors to the scenic, natural, and cultural resources of the park and give them an adequate overview of the concept that those resources are present-day manifestations of a 230-million-year-old ecosystem. Well-marked trails would provide easy access to the Painted Desert, encouraging and allowing more visitors to experience that landscape close up and at a leisurely pace.

The opportunity for park visitors to see an active fossil or archeological dig would be a key element in the park's interpretive program. Being able to see the fossils excavated and prepared for transportation to the research center and then to watch their preparation and conservation would greatly help visitors make the connection between the fossils and the fact that they are relicts – time travelers – from another age of life on Earth.

Visitors would have new opportunities to tour the historic Painted Desert Inn, where they could experience traditional southwestern art and culture and spend some time viewing the changing panorama of the Painted Desert from this inviting and comfortable setting. Rehabilitating the tread of the trail leading to the floor of the Painted Desert would make the trail safer for visitors.

Visitors would enjoy enhanced opportunities to picnic and view the Painted Desert in an attractive, comfortable setting on Chinde Point.

Visitors would have a new opportunity to see traces of historic and modern transportation corridors crossing the Puerco River valley, reinforcing their understanding and appreciation of this use of the valley.

A new visitor contact station at the Puerco ruins would help visitors understand and appreciate the significance of the archeological and historic resources in the park. The interpretive message presented in the contact station would be made more meaningful to visitors by the opportunity to walk out the door and immediately see some of the resources being interpreted.

Improved viewing devices would give visitors a much clearer view of the petroglyphs on Newspaper Rock.

Visitors would have a new opportunity to take a 1½ mile hike across the badlands between the Tepees and Blue Mesa on a semiprimitive trail, enjoying views that they could not see elsewhere in the park and adding to the variety of their park experiences.

The provision of picnic tables and restrooms at Blue Mesa would invite visitors to spend more time enjoying a variety of educational and recreational experiences including hiking both on and off trails in a variety of interesting landforms.

Deemphasizing Agate Bridge and interpreting its alteration would help visitors understand the natural evolution of the park landscape and direct their attention to more natural features and phenomena.

Eliminating the parking area at the Flattops would deny visitors easy access to the Flattops, but not to the wilderness area. The trailhead for the park's southern wilderness unit would be provided at the Giant Logs visitor center. Visitors would have to hike approximately 3 miles farther through wilderness to reach the Flattops area from this parking lot.

An expanded visitor center at Giant Logs would inform visitors about their opportunities in the park, introduce them to the resources of the Rainbow Forest area, and encourage them to discover those resources through leisurely on-site exploration, thus enriching their park experience. Relocating park housing away from this prime visitor use area would avoid any feelings of intrusion on the part of visitors or employees. Rehabilitation and adaptive use of the existing residences for concession and office

facilities would allow visitors to experience the historic ambiance of these 1930s pueblo-style structures. The new entrance road and parking lot configuration would be safer and less confusing for visitors.

People would no longer be able to drive their cars to Long Logs, so those visitors who were unable or unwilling to walk would not have the opportunity to see that resource; however, they would be able to drive to other wood sites in the park, including Giant Logs and Crystal Forest. Visitors with the time and interest to walk to Long Logs would enjoy a greater sense of discovery and adventure. Tying the visitor center and Long Logs together with a high-standard trail would encourage more visitors to take advantage of this opportunity. The natural setting of the resource at Long Logs would help people understand the natural history of the petrified wood.

Most facilities, including both visitor centers, the research center, the Painted Desert Inn, the contact station and restrooms at the Puerco ruins, the trails along the Painted Desert rim and through Long Logs, and the appropriate percentage of new employee housing, would be accessible to all visitors and employees, including people with disabilities. Although the trail to Long Logs might be too long for some mobility-impaired persons, others might welcome the opportunity to have a longer park experience away from major developed areas.

—*Proposed Boundary.* The proposed boundary expansion would greatly increase opportunities for paleontological and archeological resource interpretation and for day-hiking into the park's backcountry. Interpreter-led day hikes to a paleontological research site or to the Dead Wash petroglyphs or the Wallace tank ruin would provide visitors with a chance to learn more about the natural and cultural history of the area while also experiencing the park's backcountry. Such tours would be the highlight of a park experience for some visitors. The average length of the visitor stay should increase with increased opportunities to learn about and become involved with the resources of the park.

Flood Hazard—Existing Boundary. The road bridge, a section of the park road, parts of the

parking lot, and the sewage ponds would remain inside the 100-year floodplain. Floodproofing the sewage ponds with riprap would remove the potential threat of surface and groundwater contamination and loss of the facility in the event of a flood. The other facilities are excepted from floodplain compliance regulations. All new facilities would be located outside the 500-year floodplain of Jim Camp Wash.

Economic Impacts

Concession Operations—Existing Boundary. Concession operations within the park are provided by the Fred Harvey Company, under a 10-year concession contract that expires December 31, 1994. Any of the actions under consideration would be financially feasible for the concessioner to develop and operate. The construction costs of a new store/cafeteria and service station at the north end of the park would be offset by government compensation for removal of the existing facilities. The amount of payment would be governed by concession contract provisions. In the future, the concessioner would lease space from the government for limited concession services at the south end of the park.

Regional Tourism—Proposed Boundary. Providing more for visitors to do and increasing the length of their stay would benefit local commercial interests that provide facilities for overnight tourists. Eventually, as programs expanded within and around the park, Petrified Forest might become a destination park.

Impacts on Existing Landowners—Proposed Boundary

If Congress expanded the boundary of Petrified Forest National Park, the National Park Service would discuss management goals and priorities with all the owners of lands within the new boundary, stressing the management direction established in the general management plan. Proposals for protecting park values through cooperation with existing landowners or through acquisition of lands or interests in lands would be determined through a land protection plan. The

following discussion of possible impacts is based on a phase-out of all existing or proposed private uses of lands inside the boundary in exchange for the fair market value of the property.

State of Arizona, 33,520 acres. The state owns 52.375 sections inside the proposed boundary, scattered among the parcels. These lands are currently leased for livestock grazing. If these lands were transferred to the federal government, the state would lose the revenues produced by the grazing leases and the lessees would be displaced.

The potential for other income-producing activities on state lands is considered low. The Arizona State Land Department has closed approximately 33,800 acres adjacent to Petrified Forest National Park to both surface and subsurface applications to facilitate NPS resource studies.

Bureau of Land Management, 12,400 acres. BLM lands inside the proposed boundary cover 19.375 sections scattered among the parcels. Transfer of these lands to the National Park Service would be consistent with the bureau's plans to dispose of these parcels through exchange. Most of the BLM lands adjacent to the park have been identified for disposal (*Federal Register*, Aug. 25 and Oct. 20, 1989, and July 3, 1990).

Fitzgerald, 9,280 acres. The proposed boundary adjustment would place 18.75 sections of the Fitzgerald ranch inside the park boundary (14.5 sections of private land plus 4.25 sections of BLM and state grazing allotments in the west Chinle and Canyon Butte parcels). Acquisition of these lands might mean the removal of a significant number of cattle from one ranch.

Valley National Bank, 16,320 acres. The Valley National Bank is holding the Paulsell ranch in trust, pending its sale. The portion of the property inside the proposed boundary (25.5 sections, mostly in the east Chinle parcel, also in Dead Wash and west Chinle) is currently leased for livestock grazing. Inclusion of this property in the park boundary and acquisition by the federal government would displace the lessee.

McCauley, Valley National Bank, McKeckne, 4,160 acres. A total of 6.5 sections in the east Chinle parcel, under three ownerships, are currently leased for livestock grazing. Their inclusion in the park would phase out this source of income and displace the lessee.

Spurlock, 7,840 acres. A total of 12.25 sections of the Spurlock ranch are inside the proposed boundary, in the east Chinle parcel. These lands are currently used for livestock grazing. One section is a proposed dump site for waste that would be transported by train from the East Coast for disposal in northern Arizona. Inclusion of this parcel in the park boundary would preclude these existing and proposed sources of income.

Jeffers, 1,920 acres. The proposed boundary encompasses 3 sections owned by Jeffers in the Painted Desert parcel. These lands are currently used for livestock grazing. Inclusion in the park boundary would phase out this source of income.

Sun Country Ranches, 1,600 acres. This property includes 2.5 sections in the Painted Desert parcel. The lands are currently leased for livestock grazing. The development plans are unknown. Inclusion in the park boundary would eliminate the current source of income and preclude any future subdivision into ranchettes.

Stonewood Ranches, 7,680 acres. This property includes 12 sections in the Dead Wash parcel. The lands are currently leased for livestock grazing. The development plans are unknown. Inclusion in the park boundary would eliminate the current source of income and preclude any future subdivision into ranchettes.

New Mexico and Arizona Land Company, 4,160 acres. The proposed boundary encompasses 6.5 sections owned by this company in the Rainbow Forest and Wallace tank parcels. These lands are currently leased for grazing and petrified wood mining. Inclusion in the park boundary would phase out this source of income and displace the lessee.

Surrounding Landowners. The proposed boundary adjustments would not pose an access problem for any of the surrounding ranches. If

the Navajo Nation purchased the lands north of the east Chinle escarpment parcel, the park would share a total of 42 miles of boundary with the Navajo Reservation.

Mineral Rights. The only known active mining claim or mineral lease in the area proposed for inclusion in the park is a petrified wood mining lease. With this exception, the mineral potential in this area appears to be minimal. If Congress expanded the boundary, the status of mineral rights would be determined, and appropriate proposals to ensure protection of park values would be developed through the land protection plan.

Boundary Management Concerns

If Congress expanded the park, additional fencing would be required along most of the boundary. The addition of the west Chinle escarpment would require 13 additional miles of boundary fencing compared to the existing boundary in this part of the park. The addition of the east Chinle escarpment would require 23 additional miles of fencing; the west rim of the Painted Desert, 7 additional miles (a mile of sheep fence now exists on the north boundary of this parcel next to the Navajo Reservation); the Rainbow Forest badlands, 2 additional miles; and the Canyon Butte parcel, 1 additional mile. The addition of the Wallace tank ruins would not increase or decrease the length of the boundary in this part of the park. The addition of the Dead Wash parcel would simplify the park boundary and reduce the amount of fencing required in this part of the park from 10 miles to 6-1/2 miles. Three miles of what would be the new park boundary in this area is already fenced by the Navajo Reservation and I-40.

The segment of the park's water line and access road that is currently outside the park boundary would be brought inside the boundary with the addition of the Canyon Butte parcel.

Alternative 3: Minimum Requirements

Impacts on Natural Resources

Paleontological Resources. Impacts would be the same as described for alternative 2 except that the ease of access to the Long Logs wood site would remain a resource protection problem.

Species of Special Concern. Impacts would be the same as described for alternative 2.

Land Disturbance/Revegetation. Impacts would be the same as described for alternative 2 except at the headquarters site/Tiponi Point and Giant Logs. Reconstructing and expanding all of headquarters, including the visitor center and research center, at the existing site would disturb approximately 2 additional acres of mixed desert shrub vegetation around the periphery of the existing development site. Less than 1 acre of desert shrub would be disturbed by construction of a new gas station. No new land disturbance would occur at Tiponi Point.

A net increase of 0.5 acre of mixed desert shrub would be disturbed in the Giant Logs area. Housing and maintenance functions and facilities would be a greater visual intrusion on the outstanding natural resources at Giant Logs and Long Logs than they are currently, and a precedent would be established for continuing expansion of administrative facilities in this location.

Wilderness. Impacts would be the same as described for alternative 2.

Impacts on Cultural Resources

This alternative would have the same potential for impacts on archeological resources as described for alternative 2 except that there would be no potential for impacts at Tiponi Point.

The impacts on the Painted Desert Inn would be the same as described for alternative 2.

All of the existing structures at Giant Logs except the concession building and the concessioner residence would be retained and used; however,

they would not be rehabilitated to return them to their 1930s appearance. With no action taken to remove add-ons, roofline intrusions such as swamp coolers and solar panels, and other intrusive elements, the structures would remain ineligible for the National Register of Historic Places.

Impacts on Visitor Experience and Safety

Visitor Experience. Impacts would be the same as described for alternative 2 with the following exceptions. Reconstructing all of headquarters, including the visitor center, at the existing site would allow for a reorientation of the program presented at the visitor center, but it would not place arriving visitors near a scenic and interesting resource area where they would have easy trail access to the Painted Desert. Thus, some visitors would continue to leave the park without directly experiencing the resources.

Administrative and maintenance functions and facilities at Giant Logs might be seen by some visitors as a visual intrusion. Vegetative and structural screening would be used to minimize the visibility of the administrative facilities. This alternative would not allow for direct trail access from the visitor center to Long Logs because of the intervening parking lot. Therefore, Giant Logs would remain the focus of visitor interest in this part of the park, with the same impacts as described for no action.

Flood Hazard. Impacts would be the same as described for alternative 2.

Alternative 4: Reduce Development at Giant Logs

Impacts on Natural Resources

Paleontological Resources. Impacts would be the same as described for alternative 2.

Species of Special Concern. Impacts would be the same as described for alternative 2.

Land Disturbance/Revegetation. Impacts would be the same as described for alternative 2 except at Giant Logs. The new visitor center and road realignment at Giant Logs would disturb 1.3 acres of mixed desert shrub; however, 6.3 acres of desert shrub near Giant Logs would be revegetated, for a net change of 5 acres restored.

Wilderness. Impacts would be the same as described for alternative 2.

Scenic Vistas. The housing and maintenance structures that currently intrude upon the vistas in the Giant Logs and Long Logs areas would be removed, restoring some of the naturalness of the scene in these significant resource areas.

Impacts on Cultural Resources

The potential for impacts on archeological sites would be the same as described for alternative 2.

Impacts on the Painted Desert Inn would be the same as described for alternative 2.

Removing all the existing buildings at Giant Logs except the visitor center/ranger station and the original chief ranger's residence would result in the irreversible loss of buildings that could potentially be rehabilitated to make them eligible for the National Register of Historic Places. The historic rehabilitation of the chief ranger's residence, which is part of building 51, would preserve the best example of this building type in the park.

Impacts on Visitor Experience and Safety

Visitor Experience. Impacts would be same as described for alternative 2 except that a potential would remain for conflicts between visitors and residents in the Giant Logs area, and visitors would not have an opportunity to experience the historical ambiance of the pueblo-style building complex constructed in the 1930s.

Flood Hazard. Replacing the culvert bridge across Jim Camp Wash with a single-span bridge would remove the artificial channel constriction

and return the 500- and 100-year floodplains to containment within the existing banks. This would remove the flood hazard to the bridge, a segment of the road, and the parking lot. Necessary permits for bridge replacement would be obtained. Floodproofing the sewage ponds with

riprap would remove the potential threat of surface and groundwater contamination and loss of the facility in the event of a flood. All new structures would be located outside the 500-year floodplain.

Consultation and Coordination

Consultation and Coordination in the Development of the Proposal and Preparation of the Draft Environmental Impact Statement

November 20, 1987—Scoping for the Petrified Forest National Park general management plan (GMP) was begun with a general letter to those individuals, organizations, and agencies on the park's mailing list. This two-page letter from the Park Superintendent briefly explained the planning process of developing and analyzing an array of alternatives for long-range management of the park and requested people's involvement and participation. The scientific advisory group to the park was also consulted during the initial scoping period regarding paleontological research and administration.

February 2, 1988—NPS requested information on endangered species in the park area in a letter to the U.S. Fish and Wildlife Service (FWS), Ecological Services, Phoenix, AZ.

February 19, 1988—FWS responded with endangered species information (see appendix B).

March 18, 1988—NPS sent letters announcing the initiation of the GMP for Petrified Forest National Park and inviting participation to the Advisory Council on Historic Preservation (ACHP), Western Office of Project Review, and to the State Historic Preservation Officer (SHPO), Arizona State Parks.

March 29 and April 5, 1988—The planning announcement letter was acknowledged by the SHPO and ACHP, respectively.

March 2, 1989—NPS sent a letter of inquiry to the SHPO regarding National Register eligibility of the structures in the Rainbow Forest Historic District at the Giant Logs development area.

March 27, 1989—The SHPO responded to the request for a determination of eligibility.

April 8, 1989—The park superintendent, team captain, and other NPS representatives traveled to

Phoenix to brief the SHPO and staff on the draft alternatives.

May 4, 1989—NPS published a notification of the intent to prepare a GMP, a summary of issues, and a request for scoping comments in the *Federal Register*.

April 12, 1990—NPS published an intent to prepare an environmental impact statement in the *Federal Register*.

Summer and autumn of 1990—Early in 1990 a number of issues related to land uses outside the park required a reevaluation of the park boundary section in the draft GMP. Meetings were held with local, state, and federal agencies on the status of these land uses and their relationship to the preservation of significant resources identified in the draft GMP.

July 26-27, 1990—The Park Superintendent and Team Captain met with the Arizona State Lands Commissioner and staff and representatives of the Arizona environmental community.

September 24-28, 1990—The Park Superintendent and Team Captain met with the Apache County Manager; Holbrook City Mayor and City Manager; Congressman Jon Kyl's staff; Acting Director of Tourism, State of Arizona; Bureau of Land Management, Phoenix District Manager and staff.

November 2-3, 1990—The Team Captain met with the Trust For Public Lands. The Park Superintendent and Team Captain met with the National Parks and Conservation Association, Arizona/New Mexico Parks and Conservation Council.

January 11, 1991—The Park Superintendent and Team Captain briefed the Deputy State Director for Lands and Renewable Resources, Bureau of Land Management staff, and Arizona State Lands Commissioner and staff on the objectives of the GMP, the extent of significant resources on surrounding lands (much of it BLM and state lands), and the status of the threats to the continued existence of those significant resources.

Options for joint resource protection by the three agencies were discussed.

June 25, 1991—The draft GMP/EIS was mailed to the ACHP and SHPO for review comments.

August 12, 1991—The ACHP and SHPO responded with review comments on the draft GMP/EIS.

List of Reviewers

Copies of this document will be sent to the following agencies and organizations for review:

Arizona Congressional Delegation

Senator Dennis DeConcini
Senator John McCain
Congressman Jon Kyl

Federal Agencies

Advisory Council on Historic Preservation
Environmental Protection Agency
Navajo-Hopi Relocation Commission
U.S. Department of Agriculture
 Forest Service, Apache and Sitgreaves National Forests
U.S. Department of Defense
 U.S. Air Force, Strategic Air Command, First Electronic Combat Range Group, Detachment 2, Holbrook
U.S. Department of the Interior
 Bureau of Indian Affairs
 Bureau of Land Management, Phoenix District Office
 Fish and Wildlife Service, Phoenix Area Office

State Agencies

Arizona Commission on the Arts
Arizona Governor's Office
Arizona Department of Environmental Quality
Arizona Department of Game and Fish
Arizona Department of State Parks
Arizona Department of Tourism
Arizona Department of Transportation
Arizona Governor's Office
Arizona Land Department
Arizona State Historic Preservation Office

Local Agencies

Apache County Board of Supervisors
Holbrook City Council
Holbrook City Manager

Holbrook, Mayor of
Hopi Tribal Council
Navajo County Board of Supervisors
Navajo Nation
Springerville, Mayor of
Winslow, Mayor of
Zuni Tribal Council

Adjacent Landowners

Dobell Ranch
Fitzgerald Ranch
Jeffers Ranch
McCauley Ranch
New Mexico/Arizona Land Company
Paulsell Ranch
Rockwell Ranch
Stonewood Ranches
Sun Country Ranches
Santa Fe Railroad
Spurlock Ranch

Other

Alpine Public Library
Apache County Library
The Archaeological Conservancy
Arizona Museum of Science and Technology
Earth First!
Flagstaff City-Coconino Public Library
Fred Harvey, Inc.
Gallup Public Library
Ghost Ranch, Abiquiu, NM
Grand Canyon Trust
Holbrook Chamber of Commerce
Holbrook *Historian*
Holbrook Public Library
Holbrook *Tribune*
Larson Public Memorial Library, Lakeside, AZ
Museum of Northern Arizona
National Audubon Society
National Inholders Association
National Parks and Conservation Association
National Parks Trust
Navajo Community College Library
New Mexico Museum of Natural History
New Mexico State University Library
Northern Arizona University Library
Northland Pioneer College Library
Petrified Forest Chamber of Commerce
Petrified Forest Museum Association
Phoenix Public Library
Roxanne Whipple Memorial Library, Winslow
Sierra Club
Trust for Public Lands

Tucson Public Library
University of California at Berkeley, Museum of
Paleontology
The Wilderness Society

Appendix A: Legislation

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 697—Dec. 8, 1906—34 Stat. 3266]

WHEREAS, it is provided by section two of the Act of Congress, approved June 8, 1906, entitled, "An Act for the preservation of American Antiquities," "That the President of the United States is hereby authorized, in his discretion, to declare by public proclamation historic land marks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be National Monuments, and may reserve as a part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the object to be protected;"

AND, WHEREAS, the mineralized remains of Mesozoic forests, commonly known as the "Petrified Forest," in the Territory of Arizona, situated upon the public lands owned and controlled by the United States, are of the greatest scientific interest and value and it appears that the public good would be promoted by reserving these deposits of fossilized wood as a National monument with as much land as may be necessary for the proper protection thereof;

NOW, THEREFORE, I, Theodore Roosevelt, President of the United States of America, by virtue of the power in me vested by section two of the aforesaid Act of Congress, do hereby set aside as the Petrified Forest National Monument, subject to any valid and existing rights, the deposits of mineralized forest remains situated in Gila and Apache counties, Arizona, more particularly located and described as follows, to wit:

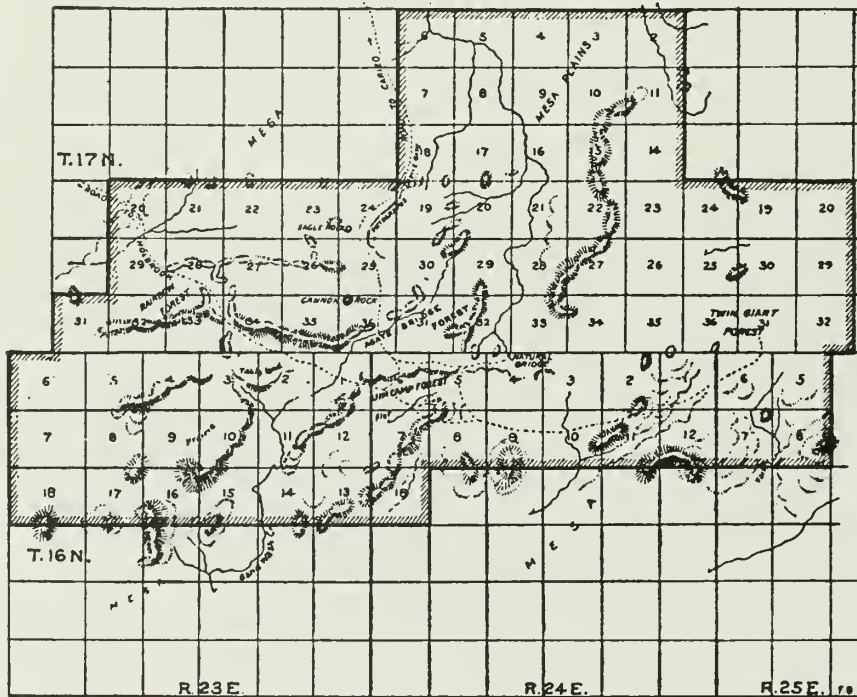
Sections 1 to 18 inclusive in township 16 north, range 23; sections 20 to 29 inclusive and sections 31 to 36 inclusive in township 17 north, range 23; sections 1 to 12 inclusive and section 18 in township 16 north, range 24; sections 2 to 11 inclusive and sections 14 to 36 inclusive in township 17 north, range 24; sections 5, 6, 7 and 8, in township 16 north, range 25; and sections 19, 20, 29, 30, 31 and 32 in township 17 north, range 25, all east of the Gila and Salt River Meridian as shown upon the map hereto attached and made a part of this proclamation.

Warning is hereby expressly given to all unauthorized persons not to appropriate, excavate, injure or destroy any of the mineralized forest remains hereby declared to be a National monument or to locate or settle upon any of the lands reserved and made a part of said monument by this proclamation.

PETRIFIED FOREST NATIONAL MONUMENT

Embracing sections 1 to 18 inclusive in T. 16 N., R. 23; sections 20 to 29 inclusive and 31 to 36 inclusive in T. 17 N., R. 23; sections 1 to 12 inclusive and sec. 18 in T. 16 N., R. 24; sections 2 to 11 inclusive and sections 14 to 36 inclusive in T. 17 N., R. 24; sections 5, 6, 7 and 8 in T. 16 N., R. 25; sections 19, 20, 29, 30, 31 and 32 in T. 17 N., R. 25, all East of the GILA and SALT RIVER MERIDIAN,
ARIZONA

Containing 60,776.02 acres



DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE,
Wm. A. Richards, Commissioner.

[MAP ATTACHED TO AND MADE A PART OF THE PROCLAMATION
DATED DECEMBER 8, 1906.]

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington, this 8th day of December, in the year of our Lord one thousand nine hundred and six and the [SEAL] Independence of the United States the one hundred and thirty-first.

THEODORE ROOSEVELT.

By the President:
ELIHU ROOT,
Secretary of State.

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 1167—July 31, 1911—37 Stat. 1716]

WHEREAS, The Petrified Forest National Monument, Arizona, created by proclamation dated December 8, 1906, has been found, through a careful geological survey of its deposits of mineralized forest remains, to reserve a much larger area of land than is necessary to protect the objects for which the Monument was created, and therefore the same should be reduced in area to conform to the requirements of the act authorizing the creation of National Monuments;

NOW, THEREFORE, I, William H. Taft, President of the United States of America, by virtue of the power in me vested by Section two of the act of Congress entitled, "An Act for the Preservation of American Antiquities", approved June 8, 1906, do hereby set aside and reserve as the Petrified Forest National Monument, subject to any valid, existing rights, the deposits of mineralized forest remains, together with enough lands to insure the protection thereof, situated in Gila and Apache counties, Arizona, these lands being more particularly located and described as follows: Sections one, two, eleven and twelve, and the east half each of sections three and ten, in township sixteen north, range twenty-three; Sections four, five, six, seven, eight and nine, and the west half each of sections three and ten, in township sixteen north, range twenty-four; Sections thirty-four, thirty-five and thirty-six, in township seventeen north, range twenty-three; Sections three to ten, inclusive, fifteen to twenty-two, inclusive, twenty-seven to thirty-three, inclusive, and the west half each of sections two, eleven, fourteen; twenty-three and twenty-six, in township seventeen north, range twenty-four, all east of the Gila and Salt River Meridian, Arizona, as shown upon the map hereto attached and made a part of this proclamation.

Warning is hereby expressly given to all unauthorized persons not to appropriate, excavate, injure or destroy any of the mineralized forest remains situated within this Monument reservation, or to locate or settle upon any of the lands reserved by this proclamation.

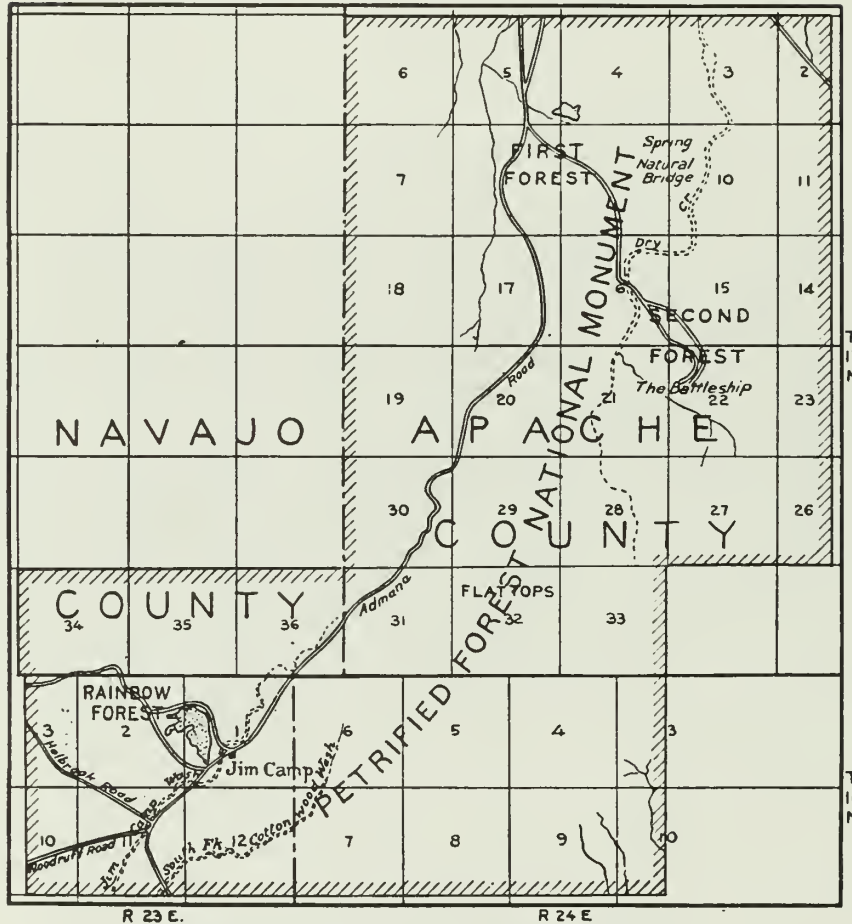
PETRIFIED FOREST NATIONAL MONUMENT

*Embracing Secs 1, 2, 11, & 12 and E½ Secs 3 & 10, T. 16 N., R. 23 E.
Secs 4 to 9 & W½ Secs 3 & 10, T. 16 N., R. 24 E. Secs 34, 35, 36, T. 17 N.
R. 23 E. Secs 3 to 10, 15 to 22, 27 to 33 & W½ Secs 2, 11, 14, 23, 26, T. 17
N. R. 24 E. Gila and Salt River Meridian*

ARIZONA

Containing 40.04 square miles

Reservation Boundary — County Boundary Collecting Grounds



DEPARTMENT OF THE INTERIOR
GENERAL LAND OFFICE
Fred Dennett, Commissioner

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the city of Washington this 31st day of July, in the year of our Lord one thousand nine hundred and eleven, and of the [SEAL] Independence of the United States the one hundred and thirty-sixth.

By the President:

ALVEY A. ADEE,
Acting Secretary of State.

WM. H. TAFT.

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 1927—Nov. 14, 1930—46 Stat. 3040]

WHEREAS it appears that the public interest would be promoted by adding to the Petrified Forest National Monument, in the State of Arizona, certain adjoining lands for the purpose of including within said monument a certain approach highway and additional features of scenic and scientific interest;

NOW, THEREFORE, I, Herbert Hoover, President of the United States of America, by virtue of the power in me vested by section 2 of the act of Congress entitled "An act for the preservation of American antiquities," approved June 8, 1906 (34 Stat. 225), do proclaim that, subject to the rights of the owners of privately owned lands and prior valid claims initiated and maintained pursuant to the land laws of the United States, the following described lands in Arizona be, and the same are hereby, added to and made a part of the Petrified Forest National Monument: those portions of the SE. $\frac{1}{4}$ and E. $\frac{1}{2}$ SW. $\frac{1}{4}$ sec. 4 lying south and east of the southern boundary of the Atchison, Topeka & Santa Fe Railway Co.'s right of way; E. $\frac{1}{2}$, SW. $\frac{1}{4}$ and that part of the E. $\frac{1}{2}$ NW. $\frac{1}{4}$ sec. 9 lying south and east of the southern boundary of said right of way; SW. $\frac{1}{4}$ sec. 10; and secs. 14 to 16, inclusive, secs. 21 to 28, inclusive, and secs. 33 to 36, inclusive, all in T. 18 N., R. 24 E., Gila and Salt River meridian, containing approximately 11,010 acres.

Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument as provided in the act of Congress entitled "An act to establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat. 535), and acts additional thereto or amendatory thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington this 14th day of November, in the year of our Lord nineteen hundred and thirty, and of the Independence of the United States of America the one hundred and fifty-fifth.

By the President:

HENRY L. STIMSON,
Secretary of State.

HERBERT HOOVER.

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 1975—Nov. 30, 1931—47 Stat. 2486]

WHEREAS it appears that the public interest would be promoted by adding to the Petrified Forest National Monument, in the State of Arizona, certain adjoining lands for administrative purposes and the protection of a certain approach highway and additional features of scenic and scientific interest;

NOW, THEREFORE, I, Herbert Hoover, President of the United States of America, by virtue of the power in me vested by section 2 of the act of Congress entitled "AN ACT For the preservation of American antiquities," approved June 8, 1906 (34 Stat. 225), do proclaim that, subject to the rights of the owners of privately owned lands and prior valid claims initiated and maintained pursuant to the land laws of the United States, the following-described lands in Arizona be, and the same are hereby, added to and made a part of the Petrified Forest National Monument: That portion of the W. $\frac{1}{2}$ NW. $\frac{1}{4}$ sec. 9 lying south and east of the southern boundary of the Atchison, Topeka & Santa Fe Railway Co.'s right of way in T. 18 N., R. 24 E., Gila and Salt River meridian.

Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument as provided in the act of Congress entitled "AN ACT To establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat. 535-536), and acts additional thereto or amendatory thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington this 30th day of November, in the year of our Lord nineteen hundred and thirty-one, and of the
[SEAL] Independence of the United States of America the one hundred and fifty-sixth.

HERBERT HOOVER.

By the President:

HENRY L. STIMSON,
Secretary of State.

BY THE PRESIDENT OF THE UNITED STATES OF AMERICA

A PROCLAMATION

[No. 2011—Sept. 23, 1932—47 Stat. 2532]

WHEREAS it appears that the public interest would be promoted by adding to the Petrified Forest National Monument, in the State of Arizona, certain adjoining lands for administrative purposes and the protection of a certain approach highway and additional features of scenic and scientific interest;

NOW, THEREFORE, I, Herbert Hoover, President of the United States of America, by virtue of the power in me vested by section 2 of the act of Congress entitled "AN ACT For the preservation of American antiquities,"

approved June 8, 1906 (34 Stat. 225), do proclaim that, subject to the rights of the owners of privately owned lands and prior valid claims initiated and maintained pursuant to the land laws of the United States, the following-described lands in Arizona be, and the same are hereby, added to and made a part of the Petrified Forest National Monument:

GILA AND SALT RIVER MERIDIAN

- T. 18 N., R. 24 E., sec. 4, all of that part not now within the monument boundaries;
sec. 9, all of that part not now within the monument boundaries.
- T. 19 N., R. 23 E., sec. 1, all;
sec. 2, all;
sec. 3, all;
sec. 10, all;
sec. 11, all;
sec. 12, all;
sec. 13, all;
sec. 14, all;
sec. 15, all.
- T. 19 N., R. 24 E., sec. 2, all, excluding and excepting right of way of U. S. Highway No. 66;
sec. 3, all, excluding and excepting right of way of U. S. Highway No. 66;
sec. 4, all;
sec. 5, all;
sec. 6, all;
- T. 19 N., R. 24 E., sec. 7, all;
sec. 8, all;
sec. 9, all;
sec. 10, all, excluding and excepting right of way of U. S. Highway No. 66;
sec. 16, all;
sec. 17, all, excluding and excepting right of way of U. S. Highway No. 66;
sec. 18, all;
sec. 21, all;
sec. 28, all;
sec. 33, all.
- T. 20 N., R. 23 E., sec. 1, all;
sec. 2, all;
sec. 3, all;
sec. 10, all;
sec. 11, all;
sec. 12, all;
sec. 13, all;
sec. 14, all;
sec. 15, all;
sec. 22, all;
sec. 23, all;
sec. 24, all;
sec. 25, all;

sec. 26, all;
 sec. 27, all;
 sec. 34, all;
 sec. 35, all;
 sec. 36, all.
 T. 20 N., R. 24 E., sec. 1, all;
 sec. 2, all;
 sec. 3, all;
 sec. 4, all;
 sec. 5, all;
 sec. 6, all;
 sec. 7, all;
 sec. 8, all;
 sec. 9, all;
 sec. 10, all;
 sec. 11, all;
 sec. 12, all;
 sec. 13, all;
 sec. 14, all;
 sec. 15, all;
 T. 20 N., R. 24 E., sec. 16, all;
 sec. 17, all;
 sec. 18, all;
 sec. 19, all;
 sec. 20, all;
 sec. 21, all;
 sec. 22, all;
 sec. 23, all;
 sec. 24, all;
 sec. 25, all;
 sec. 26, all;
 sec. 27, all;
 sec. 28, all;
 sec. 29, all;
 sec. 30, all;
 sec. 31, all;
 sec. 32, all;
 sec. 33, all;
 sec. 34, all;
 sec. 35, all, excluding and excepting right of way of
 U. S. Highway No. 66;
 sec. 36, all, excluding and excepting right of way of
 U. S. Highway No. 66.
 T. 20 N., R. 25 E., sec. 4, all;
 sec. 5, all;
 sec. 6, all;
 sec. 7, all;
 sec. 8, all;
 sec. 9, all;
 sec. 16, all;
 sec. 17, all;
 sec. 18, all;
 containing approximately 53,300 acres.

Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy, or remove any feature of this monument and not to locate or settle upon any of the lands thereof.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument as provided in the act of Congress entitled "AN ACT To establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat. 535-536), and acts additional thereto or amendatory thereof.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the seal of the United States to be affixed.

DONE at the City of Washington this 23rd day of September, in the year of our Lord nineteen hundred and thirty-two, and of the Independence of the United States of America the one hundred and fifty-seventh.

HERBERT HOOVER.

By the President:

HENRY L. STIMSON,
Secretary of State.

An Act To authorize exchanges of lands with owners of private-land holdings within the Petrified Forest National Monument, Arizona, approved May 14, 1930 (46 Stat. 278)

Petrified Forest National Monument, Ariz. Acquisition of privately owned lands within. Public lands to be given in exchange.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior, for the purpose of eliminating private holdings of land within the Petrified Forest National Monument, Arizona, is hereby empowered, in his discretion, to obtain for the United States the complete title to any or all of the lands held in private ownership within the boundaries of the Petrified Forest National Monument, Arizona, as now or as may be hereafter defined, by accepting from the owners of such privately owned lands complete relinquishment thereof and by granting and patenting to such owners, in exchange therefor, in each instance, like public lands of equal value situated in Navajo and/or Apache Counties in the State of Arizona, after due notice of the proposed exchange has been given by publication for not less than thirty days in the counties where the lands proposed to be exchanged or taken in exchange are located: *Provided*, That the Secretary of the Interior shall, on application or otherwise, designate public lands located outside the extreme boundaries of the said monument subject to exchange under this Act which are, in his opinion, chiefly valuable for grazing and raising forage crops, do not contain merchantable timber, are not susceptible of irrigation from any known source of water supply, and are of character similar to the privately owned lands offered in exchange. (U.S.C., 6th supp., title 16, sec. 444.)

Provided.
Nature of lands.

Value of lands to be ascertained.

SEC. 2. That the value of all patented lands within said monument offered for exchange, and the value of the lands of the United States to be given in exchange therefor, shall be ascertained in such manner as the Secretary of the Interior may direct; and the owners of such privately owned lands within said monument shall, before any exchange is effective, furnish the Secretary of the Interior evidence satisfactory to him of title to the patented lands offered in exchange; and lands conveyed to the United States under this Act shall be and remain a part of the Petrified Forest National Monument. (U.S.C., 6th supp., title 16, sec. 444a.)

Title required.

An Act To authorize the establishment of the Petrified Forest National Park in the State of Arizona, and for other purposes, approved March 28, 1958 (72 Stat. 69)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to permit the establishment of the Petrified Forest National Monument, Arizona, and other lands as provided for herein, as the Petrified Forest National Park, such national park shall be established (a) after title to all of the lands described in section 2 of this Act shall have been vested in the United States, with the exception of such easements and rights-of-way for railroad, public utilities, and highway purposes as may be acceptable to the Secretary of the Interior, and (b) when notification of the effective date of such establishment of the park, as determined by the said Secretary, is published in the Federal Register. Disestablishment of the Petrified Forest National Monument shall be effected concurrently with the establishment of the park.

Petrified Forest National Park, Ariz. Establishment.

Publication in F.R.

The Petrified Forest National Park shall be preserved and administered in its natural condition by the Secretary of the Interior for the public benefit in accordance with the general laws governing areas of the National Park System and in accordance with the basic policies relating thereto as prescribed by the Act of August 25, 1916 (39 Stat. 535; 16 U.S.C., 1952 edition, secs. 1-3).

The exchange authority prescribed for the Petrified Forest National Monument in the Act of May 14, 1930 (46 Stat. 278; 16 U.S.C., 1952 edition, secs. 444, 444a), is hereby extended to all the lands within the Petrified Forest National Park as herein authorized.

For the purposes of this Act, the Secretary is authorized to acquire, in such manner as he shall consider to be in the public interest, any non-Federal land or interests in land within the area hereby authorized to be established as the Petrified Forest National Park. In acquiring any State-owned land or interests therein within the aforesaid area, such property may be procured by the United States without regard to any limitations heretofore prescribed by the Congress relating to the disposal of State-owned properties.

Upon establishment of the Petrified Forest National Park, as authorized by this Act, any remaining balance of funds that may be available for purposes of the Petrified Forest National Monument shall thereafter be

available for expenditure for purposes of the Petrified Forest National Park. (16 U.S.C. §119.)

Sec. 2. The Petrified Forest National Park, authorized to be established pursuant to section 1 of this Act, shall comprise the following described lands:

GILA AND SALT RIVER MERIDIAN

Township 20 north, range 23 east: Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 27, 34, 35, 36, all.

Township 20 north, range 24 east: All.

Township 20 north, range 25 east: Sections 4, 5, 6, 7, 8, 9, 16, 17, 18, all.

Township 19 north, range 23 east: Sections 1, 2, 3, 10, 11, 12, 13, 14, 15, all.

Township 19 north, range 24 east: Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, all; section 11, northwest quarter and north half northeast quarter; sections 16, 17, 18, 21, 28, 33, all.

Township 18 north, range 24, east: Sections 4, 9, all; section 10, southwest quarter; sections 13, 14, 15, 16, 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35, 36, all.

Township 17 north, range 24 east: Sections 2, 11, 14, 23, 26, west halves; sections 3, 4, 5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 29, 30, 31, 32, 33, all.

Township 17 north, range 23 east: Sections 34, 35, 36, all.

Township 16 north, range 24 east: Sections 3 and 10, west halves; sections 4, 5, 6, 7, 8, 9, all.

Township 16 north, range 23 east: Sections 1, 2, 11, 12, all; sections 3, 10, east halves. (16 U.S.C. § 119a.)

An Act to designate certain lands as wilderness. (84 Stat. 1105)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

* * * * *

DESIGNATION OF WILDERNESS AREAS WITHIN NATIONAL
PARKS AND MONUMENTS

SEC. 2. In accordance with section 3(c) of the Wilderness Act (78 Stat. 890; 16 U.S.C. 1132(c)), the following lands are hereby designated as wilderness:

(a) certain lands in the Craters of the Moon National Monument, which comprise about forty-three thousand two hundred and forty-three acres and which are depicted on a map entitled "Wilderness Plan Craters of the Moon National Monument, Idaho," numbered 131-91,000 and dated March 1970, which shall be known as the "Craters of the Moon National Wilderness Area";

(b) certain lands in the Petrified Forest National Park, which comprise about fifty thousand two hundred and sixty acres and which are depicted on a map entitled "Recommended Wilderness, Petrified Forest National Park, Arizona", numbered NP-PF-3320-O and dated November 1967, which shall be known as the "Petrified Forest National Wilderness Area".

* * * * *

SEC. 4. As soon as practicable after this Act takes effect, a map and a legal description of each wilderness area shall be filed with the Interior and Insular Affairs Committees of the United States Senate and the House of Representatives, and such description shall have the same force and effect as if included in this Act: *Provided, however,* That correction of clerical and typographical errors in such legal description and map may be made.

SEC. 5. Wilderness areas designated by or pursuant to this Act shall be administered in accordance with the provisions of the Wilderness Act governing areas designated by that Act as wilderness areas, except that any reference in such provisions to the effective date of the Wilderness Act shall be deemed to be a reference to the effective date of this Act, and any reference to the Secretary of Agriculture shall be deemed to be a reference to the Secretary who has administrative jurisdiction over the area.

Approved October 23, 1970.

PETRIFIED FOREST NATIONAL PARK, AMENDMENT

For Legislative History of Act see Report for P.L. 99-250 in Legislative History Section, post

An Act to amend the Act establishing the Petrified Forest National Park.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 2 of the Act of March 28, 1958 (72 Stat. 69), to establish the Petrified Forest National Park, is amended by inserting the following at the end thereof: "Township 19 north, range 24 east: the southwest quarter of the southwest quarter of section 27."

SEC. 2. The provisions of this Act shall not take effect until the Secretary of the Interior determines that fee simple title to the property described in section 1 has vested in the United States. Such determination of the Secretary shall be published in the Federal Register.

Approved February 27, 1986.

Appendix B: Consultation with the U.S. Fish and Wildlife Service



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

ECOLOGICAL SERVICES
3616 W. Thomas, Suite 6
Phoenix, Arizona 85019

February 19, 1988

Memorandum

To: Superintendent, Petrified Forest National Park, National Park Service, Arizona 86028

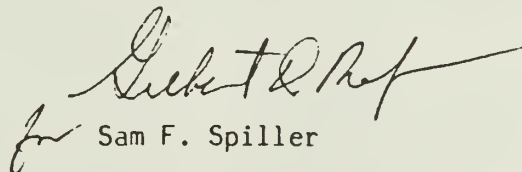
From: Field Supervisor

Subject: Request for Endangered Species Information

This responds to your request of February 2, 1988 for information on species listed or proposed to be listed as threatened or endangered that may be found on the Petrified Forest National Park, Apache and Navajo Counties, Arizona.

Our data indicate no listed or proposed threatened or endangered species are resident in the Park. However; Astragalus xiphoides, a candidate category 1 plant species; and Phacelia cephalotes, Pediocactus papyracanthus and Amsonia peeblesii, three candidate category 2 plant species, are found near the Park and may occur on your lands as well. Category 1 species are those for which we have sufficient information to support their listing as threatened or endangered. Category 2 species are those for which sufficient information is not currently available to support their listing. Such information is actively being sought. Neither category is protected under the Endangered Species Act. Information on them is provided for your planning purposes only.

If we may be of further assistance, please contact Ms. Lesley Fitzpatrick or me (Telephone: 602/261-4720).


for Sam F. Spiller

cc: Regional Director, Fish and Wildlife Service, Albuquerque. New Mexico
(Fish and Wildlife Enhancement)
Director, Arizona Game and Fish Department, Phoenix, Arizona

Appendix C: Supporting Statements Regarding the Paleontological and Archeological Values of the Proposed Additions

The strata exposed on the Paulsell Ranch are exceptional. In fact a number of the exposures are superior to any within the Park. The lateral continuity of the outcrops affords the opportunity to do detailed profiling of the geometries of these Triassic fluvial complexes within the Chinle Formation. This is an important and an extremely valuable technique that will allow reconstruction of the size, type, and evolution of the drainage networks and area that existed during the late Triassic in northeastern Arizona....

The paleogeomorphology and regional tectonic settings of the Chinle Formation are only now being studied (and restudied) in earnest. Previously held ideas concerning the above as well as the paleoclimate are being challenged. The exposures on the Paulsell Ranch not only are exceptional but are the last continuous outcrops as one goes east from the Petrified Forest National Park. Careful analyses of these outcrops clearly will allow a broader and more accurate reconstruction of the late Triassic history of the area. This is critical because most interpretations to date of the physical environments of deposition are based on fragmentary data obtained within and around the Park. The quality of the exposures on the Paulsell Ranch is such that much needed information can be obtained there. This will result in considerable refinement of our concepts of the climatic and geographic evolution of the area and thereby contribute to regional paleogeographic reconstructions. It has to be remembered that the Chinle Formation in the Petrified Forest National Park is considered to be a model for late Triassic continental sedimentation in the southwest and is used by scientists worldwide as a standard....

The amount of fossil material preserved in these strata on the ranch is considerable. During my visit there I was impressed with the quality of the fossil-bearing horizons throughout the ranch. I am certain that these strata will yield as much, if not more, material than in the Park. These strata are in the same stratigraphic

intervals as those in the Park which have yielded so much valuable scientific data....

I was very impressed with the quality and quantity of the petrified wood on the ranch....

This ranch is a natural laboratory for a variety of geologic, biologic, and archaeologic research. The work that has been done and that is ongoing in the Park needs to be expanded. Acquisition of this contiguous parcel of land will clearly provide the scientific community with needed materials.

Larry T. Middleton
Associate Professor, Geology
Northern Arizona University

The Paulsell Ranch area has unparalleled potential for research in the Triassic Chinle Formation, one of the most significant geologic formations on the Colorado Plateau. The Chinle contains tremendous information of the geologic evolution of southwest North America during the Triassic. Sedimentologic, stratigraphic, and paleontological evidence can be used to document changing conditions during one of the most dynamic periods of time in central Arizona.

In addition, the area contains the Rio Puerco, a modern streambed that could be used as a sedimentologic laboratory.

Ronald C. Blakey
Chair and Professor, Geology
Northern Arizona University

[The paleontological and archeological resources on the Paulsell ranch] are excellent, and their proximity to the well-studied deposits of the Park make it all the more important that they are available to posterity....

In 1981 we collected a phytosaur skull from a section just adjacent to the ones he [Paulsell] owns....

Mr. McCauley quickly recovered a 4" tall child's clay pitcher, obviously the work of a young Anasazi from centuries ago. Apparently this is a common happenstance....

If Paulsell's ranch were made available for paleontological study, I would be most interested in undertaking some aspects of this, and gladly in cooperation with others....

The regions of Billings Gap, Ninemile Wash, and Twin Buttes are prime areas that would give us further understanding of the area's paleontology, and could well help to tie in disparate sections from the north and south ends of the Park.

Kevin Padian
Associate Professor and
Curator
Museum of Paleontology
University of California,
Berkeley

I am familiar with the area in question, having done a paleontological reconnaissance in the Billings Gap area in 1988. The potential is enormous. We were only in there for a few days, and what we observed was fabulous....The Park is truly one of the only "windows" into the Late Triassic ecosystems in the world, and such rare opportunities should be preserved at the highest priority level. The addition of the Paulsell Ranch property would enhance this resource enormously. It is fairly untouched, providing the opportunity for researchers to have an unspoiled view of the Chinle Formation, and its fantastic fauna and flora. Commercialization would decimate the area in a very few years, and of course a solid

waste disposal site would destroy the area forever.

Spencer G. Lucas
Curator of Paleontology
New Mexico Museum of
Natural History

The "rock art galleries" that can be found on the Paulsell Ranch are irreplaceable. They are, for the most part, free of vandalism and constitute an invaluable treasure that merit protection and preservation....

I consider the land embraced by the Paulsell Ranch as a unique part of our national heritage. A priceless outdoor lab for geologists, archaeologists, biologists, paleontologists and ecologists, it absolutely merits preservation for future generations.

Ekkehart Malotki
Professor of Languages
Northern Arizona University

Petrified wood may contain fossilized evidence of wood eating arthropods such as termites and wood boring beetles. Such evidence is important to document insect macroevolution. In addition, we would be interested in survey work on the arthropods in the diverse ecosystems on site.

E.A. Bernays
Professor and Head,
Department of Entomology
The University of Arizona,
Tucson

Petrified Forest National Park is one of the world's greatest storehouses of Upper Triassic plant and animal fossils. It contains not only some of the largest known and most famous deposits of colorful petrified wood in the world, but an extraordinary number and variety of other plant and animal fossils as well....

The [Paulsell] ranch contains broad exposures of the same strata that are so richly fossiliferous in the park. There is every reason to expect that those strata in the Paulsell Ranch will be as productive as they are in the park....It has been my experience that every time I explore a new area for Upper Triassic fossils I find not only previously known fossils but new ones as well. By adding this property to the park there is the potential of making a world-class storehouse of ancient life still more important and significant to science.

The Paulsell Ranch includes well-developed badland areas which would make it an unexcelled laboratory for the study of the sedimentology and stratigraphy of a highly varied Upper Triassic fluvial/lacustrine complex. Also, the property could be used as a laboratory for the study of the development of desert landforms.

Sidney Ash
Professor of Geology
Weber State University

My crews could literally discover more scientifically valuable vertebrate fossils on the Paulsell property in a single day, than during two weeks collecting elsewhere in the park.

Robert A. Long
Museum of Paleontology
University of California,
Berkeley

There are few places in Arizona and on the Colorado Plateau that preserve a record of that time period and in such richness as the area outside of the NPS lands. At all costs this land and its contents must be saved.

Jim I. Mean
Associate Director
Laboratory of Quaternary
Paleontology
Northern Arizona University

The Paulsell Ranch site is of inestimable paleontological and geological importance because of its extensive exposures of the Upper Triassic Chinle Formation.

Sites in and adjacent to Petrified Forest National Park and elsewhere in the greater four corners area have continued to yield important new information about the beginning of the age of dinosaurs in North America. Although a number of important discoveries were made in the Paulsell Ranch region during the earlier parts of the century by, among others, Charles Camp at the Museum of Paleontology of the University of California, Berkeley, and Maurice Mehl of the University of Oklahoma, access to this property by researchers has been severely restricted in recent years. Because of the recent emphasis on trying to reconstruct the environments in and around the Petrified Forest during the Triassic Period, the Paulsell sites have become even more important to researchers during the past decade....

Readings, conversations with archeologists, and firsthand observation of sites have convinced me that the importance of the area as a repository of archeological information is fully equal to its geological and paleontological significance.

The site's location in the Painted Desert means that preserving it will conserve one of the most beautiful natural areas in the southwest.

J. Michael Parrish
Assistant Professor,
Department of Biological
Sciences
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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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